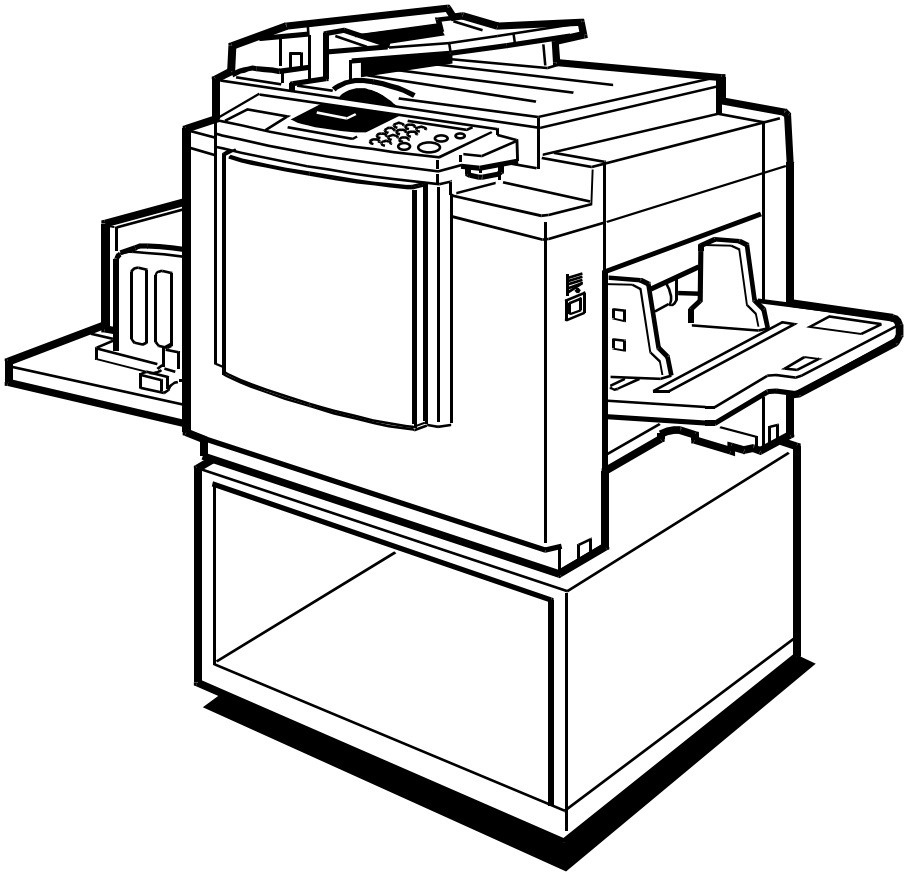
SERVICE MANUAL

(Machine code: C231)



IMPORTANT SAFETY NOTICES

PREVENTION OF PHYSICAL INJURY

1. Before disassembling or assembling parts of the printer and peripherals, make sure that the power cord is unplugged.
2. The wall outlet should be near the printer and easily accessible.
3. If any adjustment or operation check has to be made with exterior covers off or open while the main switch is turned on, keep hands away from electrified or mechanically driven components.

HEALTH SAFETY CONDITIONS

1. If you get ink in your eyes by accident, try to remove it with eye drops or flush with water as first aid. If unsuccessful, get medical attention.
2. If you ingest ink by accident, induce vomiting by sticking a finger down your throat or by giving soapy or strong salty water to drink.

OBSERVANCE OF ELECTRICAL SAFETY STANDARDS

1. The printer and its peripherals must be installed and maintained by a customer service representative who has completed the training course on those models.

⚠CAUTION

The RAM has a lithium battery which can explode if handled incorrectly. Replace only with the same type of RAM. Do not recharge or burn this battery. Used RAM's must be handled in accordance with local regulations.

⚠ATTENTION

La carte RAM comporte une pile au lithium qui présente un risque d'explosion en cas de mauvaise manipulation. Remplacer la pile uniquement par une carte RAM identique. Ne pas recharger ni brûler cette pile. Les cartes RAM usagées doivent être éliminées conformément aux réglementations locales.

SAFETY AND ECOLOGICAL NOTES FOR DISPOSAL

1. Dispose of replaced parts in accordance with local regulations.
2. Used ink and masters should be disposed of in an environmentally safe manner and in accordance with local regulations.
3. When keeping used lithium batteries (from the main processing units) in order to dispose of them later, do not store more than 100 batteries (from the main processing units) per sealed box. Storing larger numbers or not sealing them apart may lead to chemical reactions and heat build-up.

1. OVERALL INFORMATION

1.1 SPECIFICATION

Configuration:	Desktop
Master Processing:	Digital with 300 dpi thermal head
Scanning (Pixel Density):	Contact image sensor (300 dpi), with xenon lamp * In Fine mode, 400 dpi in the sub-scanning resolution
Printing Process:	Fully automatic one-drum stencil system
Original Type:	Sheet/Book
In Platen Mode:	Document size: Maximum 257 x 364 mm [10.2" x 14.4"] Thickness: Less than 30 mm Weight: Less than 5 kg
In ADF Mode:	Document size: Maximum 257 x 364 mm [10.2" x 14.4"] Minimum 148 x 105 mm [5.8" x 4.1"] Document weight: 50 - 90 g/m^2 [13.3 - 23.9 lb] (40 - 120 g/m^2 [10.6 - 31.9 lb] in single sheet feed) ADF capacity: 30 sheets (using 20 lb or 80 g/m^2 paper)

Reproduction Ratios:

	Inch version	Others
Full Size:	100%	100%
Reduction:	65%	71%
	74%	82%
	77%	87%
	93%	93%
Enlargement:	121%	115%
	129%	122%
	155%	141%

Image Modes:	Letter, Photo, Letter/Photo, Fine, Tint

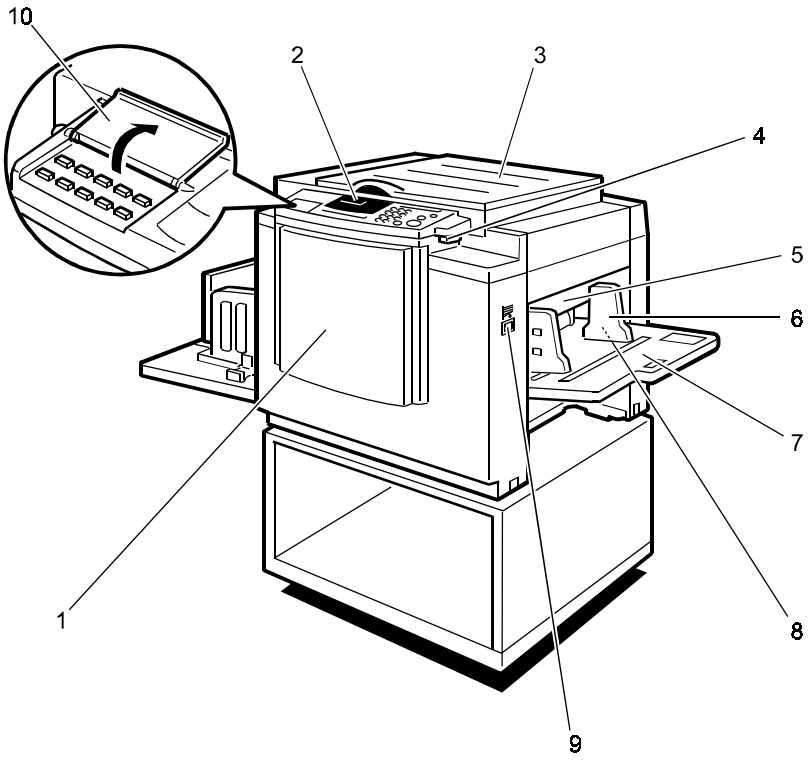
Printing Area: (At 20 °C/ 65 % RH)	B4 size drum models: 250 mm x 355 mm Legal size drum models: 210 mm x 355 mm [8.2" x 13.9"] A4 size drum models: 210 mm x 288 mm [8.2" x 11.3"]
Edge Margins:	Leading edge: 5 ± 3 mm (At the "0" position of Image Shift mode) Trailing edge: 2 mm
Print Paper Size:	Minimum: 90 mm x 148 mm [3.6" x 5.9"] Maximum: 267 mm x 390 mm [10.5" x 15.3"]
Print Paper Weight:	47.1 g/m^2 to 157.0 g/m^2 [12.5 lb to 41.7 lb]
Printing Speed:	80, 100, 120 sheets/minute (3 steps)
Master Process Time:	Platen mode: Less than 28 seconds (A4 paper) ADF mode: Less than 30 seconds (A4 paper)
Master Eject Box Capacity:	40 masters (Normal conditions) (30 masters at low temperatures)
Side Registration Adjustable Range:	± 10 mm
Vertical Registration Adjustable Range:	± 10 mm
Paper Feed Table Capacity:	1000 sheets (80 g/m^2 / 20 lb)
Paper Delivery Table Capacity:	1000 sheets (80 g/m^2/ 20 lb)
Power Source:	110/120 V, 50/60 Hz: 2.5 A 220 - 240 V, 50/60 Hz: 1.5 A
Maximum Power Consumption:	250 W
Noise Emission: (At operation position)	At 80 rpm printing speed: 71 dB At 100 rpm printing speed: 72 dB At 120 rpm printing speed: 72 dB

Weight:	65 kg [143.3 lb] 68 kg [149.9 lb] with ADF
Dimensions: (Width x Depth x Height)	Trays closed: 594 mm x 601 mm x 567 mm With ADF: 594 mm x 601 mm x 617 mm Trays open: 1187 mm x 601 mm x 567 mm With ADF: 1187 mm x 601 mm x 617 mm
Master Type:	<u>Master for B4 drum</u> Thermal master roll type: 280 mm width, 125 m/roll Yield: 260 masters/roll Max run length per master: 2,000 prints <u>Master for A4/Legal drum</u> Thermal master roll type: 240 mm width, 125 m/roll Yield: 300 masters/roll (A4 drum) 260 masters/roll (Legal drum) Max run length per master: 2,000 prints
Master Storage Conditions:	Temperature: 0 °C to 40 °C Humidity: 10% to 95% RH Recommended maximum storage period: One year after production date * Avoid locations exposed to direct sunlight.

Ink Type	600 ml cartridge type Available colors: Black, Red, Blue, Green, Brown
Ink Storage Conditions:	Temperature: -5 °C to 40 °C (Optimum conditions: 15 °C to 25 °C) Humidity: 10% to 95% RH (Optimum conditions: 20% to 70% RH) Recommended maximum storage period: One year after production date * Avoid locations exposed to direct sunlight.
Available Options	• Color Drum • Document Feeder • Key Counter • Tape Marker • PC Controller

1.2 GUIDE TO COMPONENTS AND THEIR FUNCTION

1.2.1 MACHINE EXTERIOR



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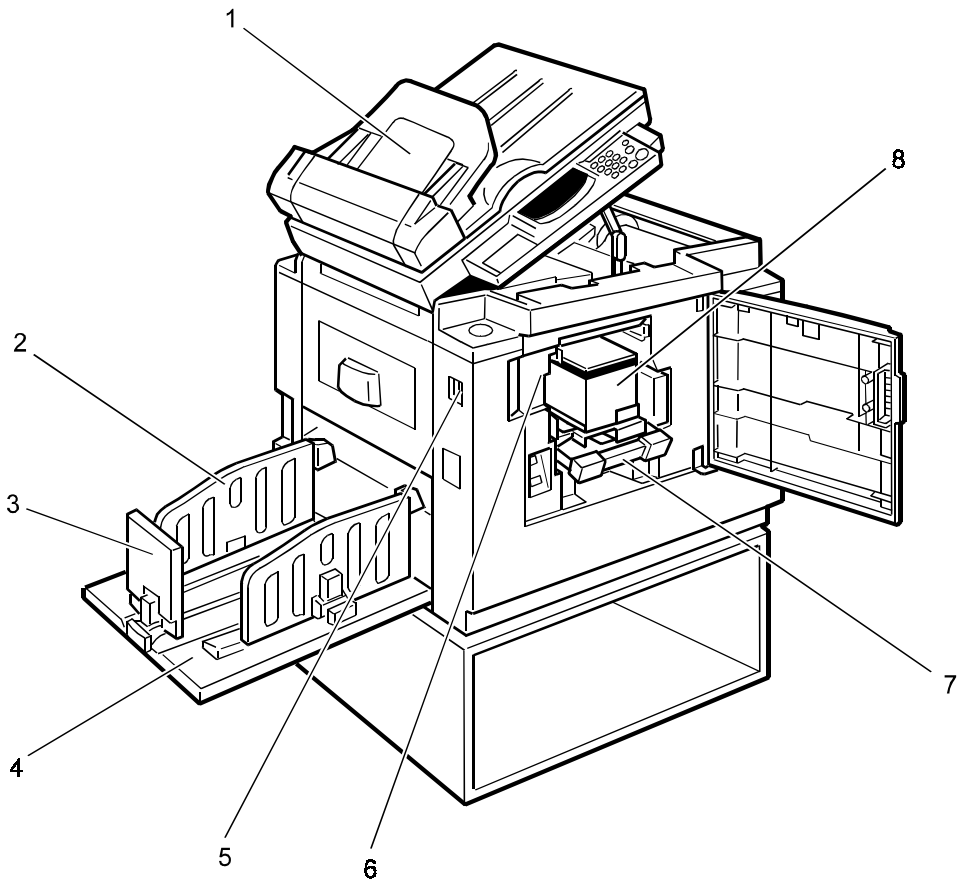
1.	**Front Door**	Open for access to the inside of the machine.
2.	**Operation Panel**	Operator controls and indicators are located here.
3.	**Platen Cover**	Lower this cover over an original before printing.
4.	**Original Table Release Lever**	Use to open the original table unit when installing the master.
5.	**Feed Roller Pressure Lever**	Use to adjust the contact pressure of the paper feed roller according to paper thickness.
6.	**Paper Feed Side Plates**	Use to prevent paper skew.
7.	**Paper Feed Table**	Set paper on this table for printing.
8.	**Side Table Fine Adjusting Dial**	Use to shift the paper feed table sideways.
9.	**Paper Feed Table Down key**	Press to lower the paper feed table.
10.	**Behind Cover**	Flip up when you wish to use the keys underneath.

1.2.2 MACHINE INTERIOR



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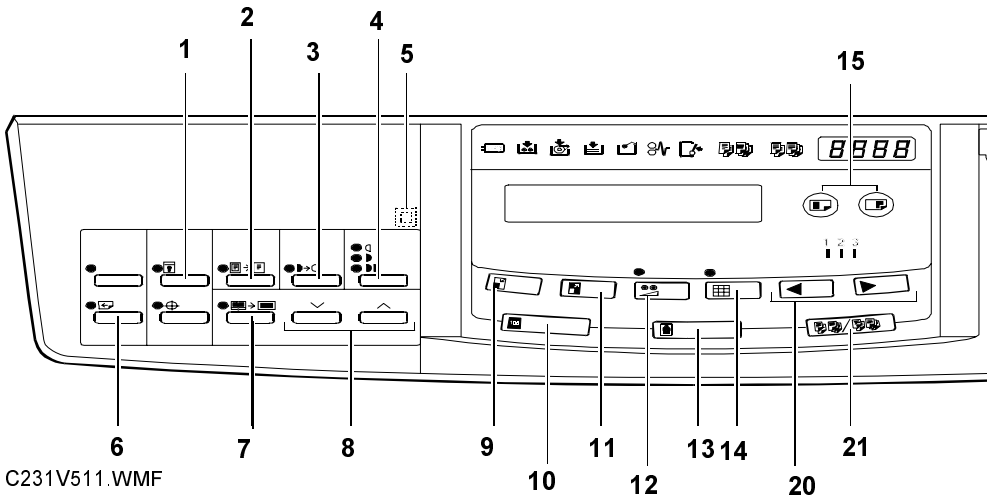
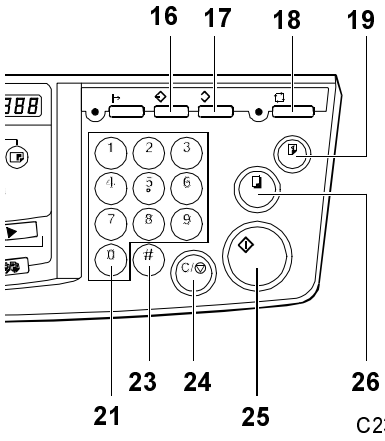
1.	**Document Feeder (Option)**	Originals inserted into the document feeder are individually and automatically fed onto and removed from the exposure glass.
2.	**Paper Delivery Side Plates**	Use to align the prints on the paper delivery table.
3.	**Paper Delivery End Plate**	Use to align the leading edge of prints.
4.	**Paper Delivery Table**	Completed prints are delivered here.
5.	**Main Switch**	Use to turn the power on or off.
6.	**Drum Unit**	The master is wrapped around this unit.
7.	**Drum Unit Lock Lever**	Lift to unlock and pull out the drum unit.
8.	**Ink Holder**	Set the ink cartridge in this holder.

1.2.3 OPERATION PANEL

Keys



1. **Security key**
   Press to make prints of confidential documents.
2. **Paste Shadow Erase key**
   Press to erase the shadows on images of pasted originals.
3. **Tint key**
   Press to make prints in grey. (This is the Tint/Economy key for the China version.)
4. **Image Density key**
   Press to make prints darker or lighter.
5. **Check Indicator**
   This indicator lights when you have selected one or more of the functions accessed by lifting the behind cover and pressing the keys underneath (e. g. Security key, Paste Shadow Erase key etc.). This lets you know whether one or more of these functions is selected, even if the cover is lowered.
6. **Skip Feed key**
   Press to select skip feed printing.
7. **Center/Edge Erase key**
   Press to print book originals that have a solid image on the center or edges.
8. **Scroll keys**
   Press to select size and direction of paper or original for Center/Edge Erase.
9. **Reduce key**
   Press to reduce the image.
10. **Full Size key**
    Press to make full size prints.
11. **Enlarge key**
    Press to enlarge the image.
12. **Economy key**
    Press to save ink. (This is the Combine 2 Originals key for the China version.)
13. **Type of Original key**
    Press to select Letter, Photo, or Letter/Photo mode.
14. **Fine key**
    Press to select fine image mode.
15. **Image Position key**
    Press to shift the image forwards or backwards.



16. Program key
Press to input or recall user programs.

17. Clear Modes key
Press to clear the previously entered job settings.

18. Auto Cycle key
Use to process the master and make prints automatically.

19. Proof key
Press to make proof prints.

20. Speed keys
Press to adjust the printing speed.

21. Memory/Class key
Press to select Memory or Class mode.

22. Number keys
Press to enter the desired number of prints and data for selected modes.

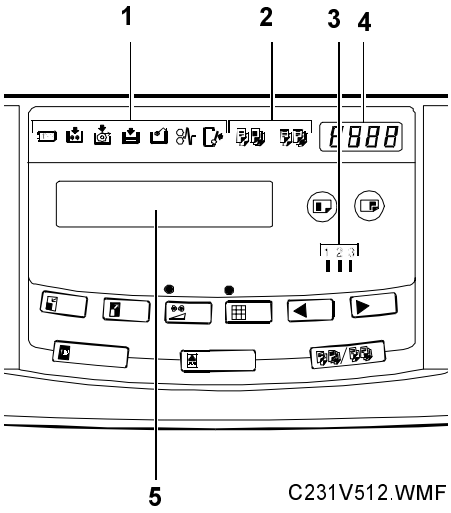
23. # key
Use to enter data in selected modes.

24. Clear/Stop key
While entering numbers, press to cancel a number you have entered. While copying, press to stop copying.

25. Start key
Press to make a master.

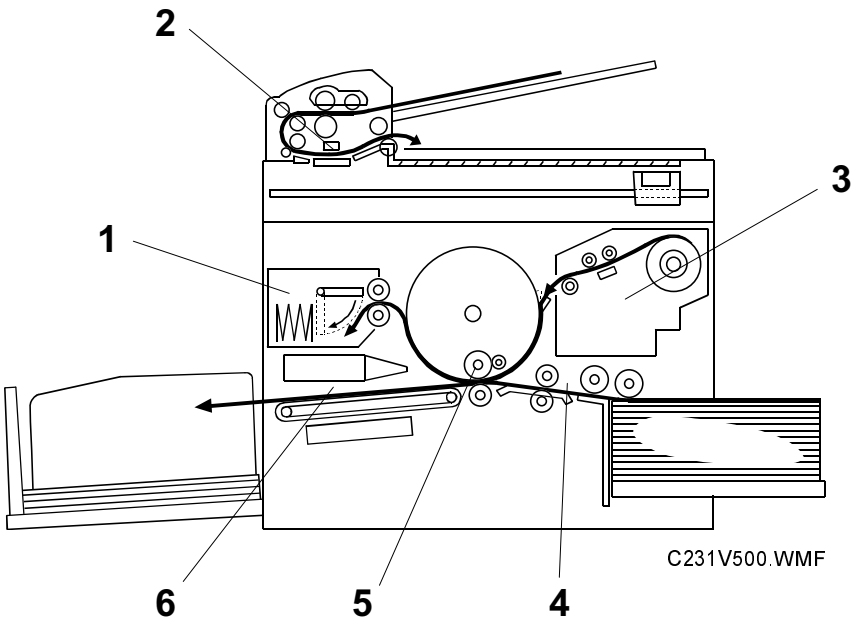
26. Print key
Press to start printing.

Indicators



1. **Error indicators**
   These indicators are lit when a non-standard condition occurs within the machine.
2. **Memory/Class Indicator**
   Shows the number entered in Memory or Class mode.
3. **Speed indicator**
   These indicators show the printing speed that is selected.
4. **Counter**
   Displays the number of prints entered. While printing, it shows the number of prints remaining.
5. **Guidance Display**
   Display the machine's condition.

1.3 PRINTING PROCESS



1. Master Eject: Ejects the used master wrapped around the drum into the master eject box.

2. Scanning: The scanner, which is composed of the contact image sensor (CIS) and xenon lamp, scans the original image.

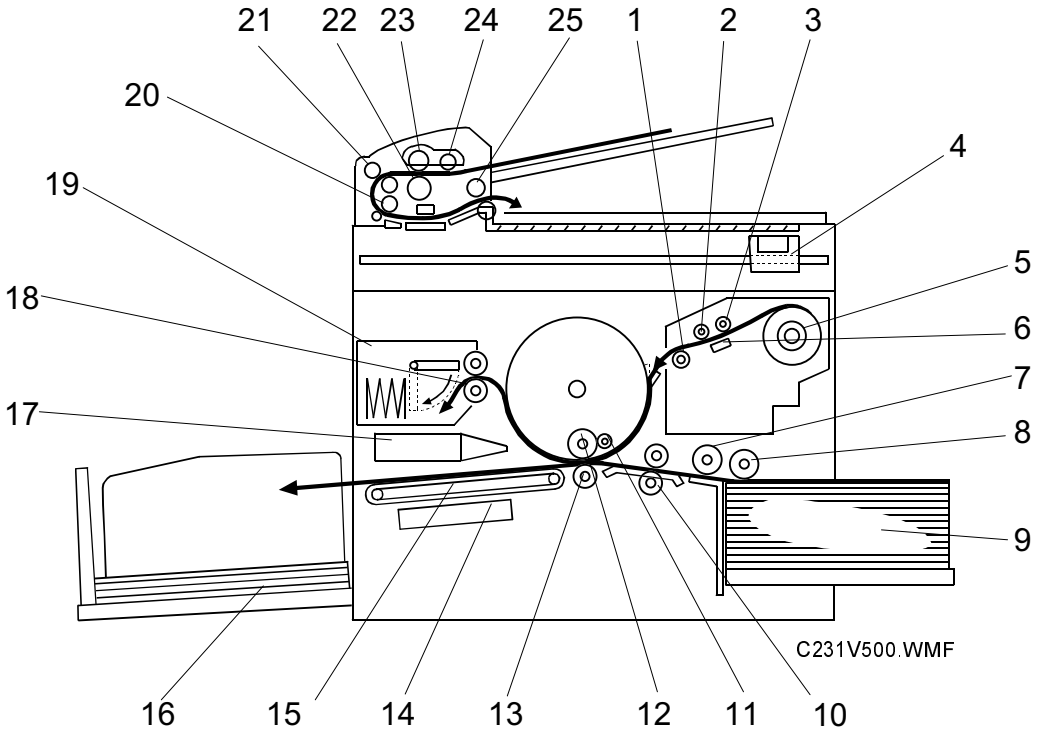
3. Master Feeding: Converts the image signal read by the CIS into digital signals and sends them to the thermal head to develop the image on the master. The master then wraps around the drum.

4. Paper Feeding: Sends paper to the drum section.

5. Printing: Presses the paper fed from the paper feed section to the drum. This transfers the ink to the paper through the drum screen and the master.

6. Paper Delivering: Peels the printed paper with the exit pawl and air knife, and ejects the paper onto the paper delivery table.

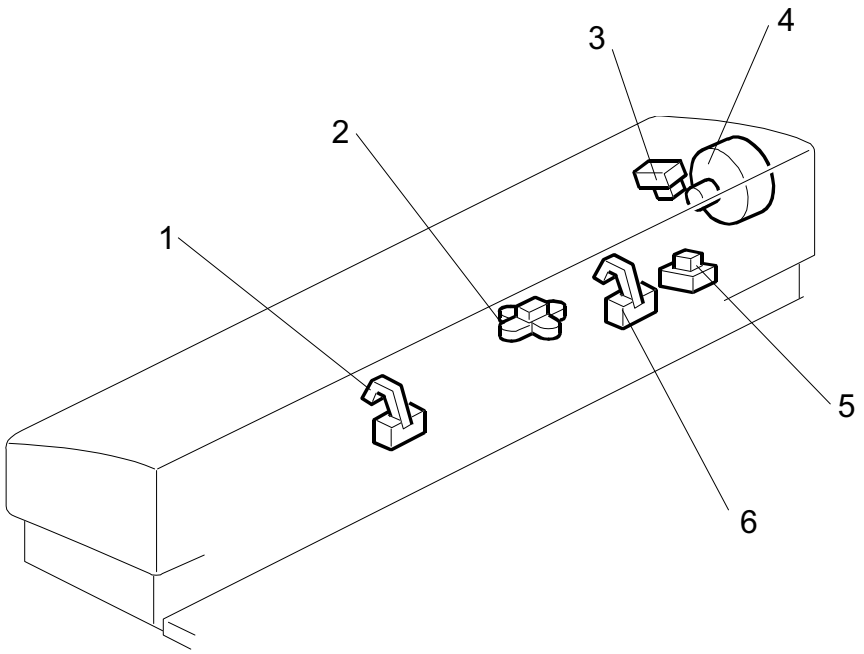
1.4 MECHANICAL COMPONENT LAYOUT



1. Tension Roller
2. Master Feed Roller
3. Platen Roller
4. Scanner
5. Master Roll
6. Thermal Head
7. Paper Feed Roller
8. Paper Pick-up Roller
9. Paper Table
10. Registration Roller
11. Doctor Roller
12. Ink Roller
13. Press Roller
14. Vacuum Fan Motor
15. Transport Belts
16. Paper Delivery Table
17. Air Knife Fan Motor
18. Master Eject Roller
19. Master Eject Box
20. DF R1 Roller
21. DF R0 Roller
22. DF Separation Roller
23. DF Document Feed Roller
24. DF Pick-up Roller
25. DF R2 Roller

1.5 ELECTRICAL COMPONENT LAYOUT

1.5.1 ADF



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Motors

Index No.	Name	Function
4	ADF Motor	Drives the original.

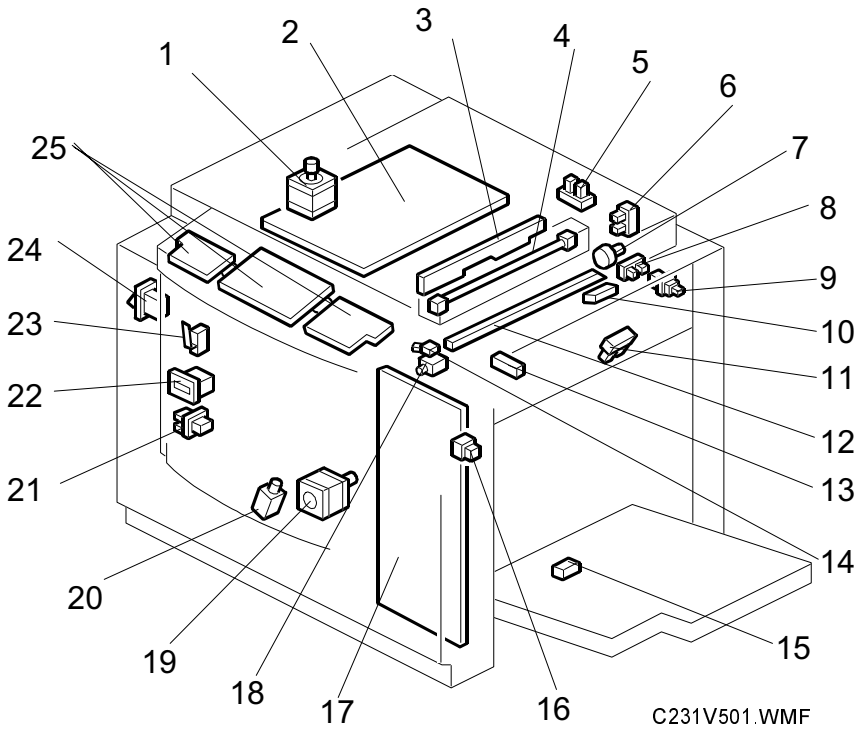
Switches

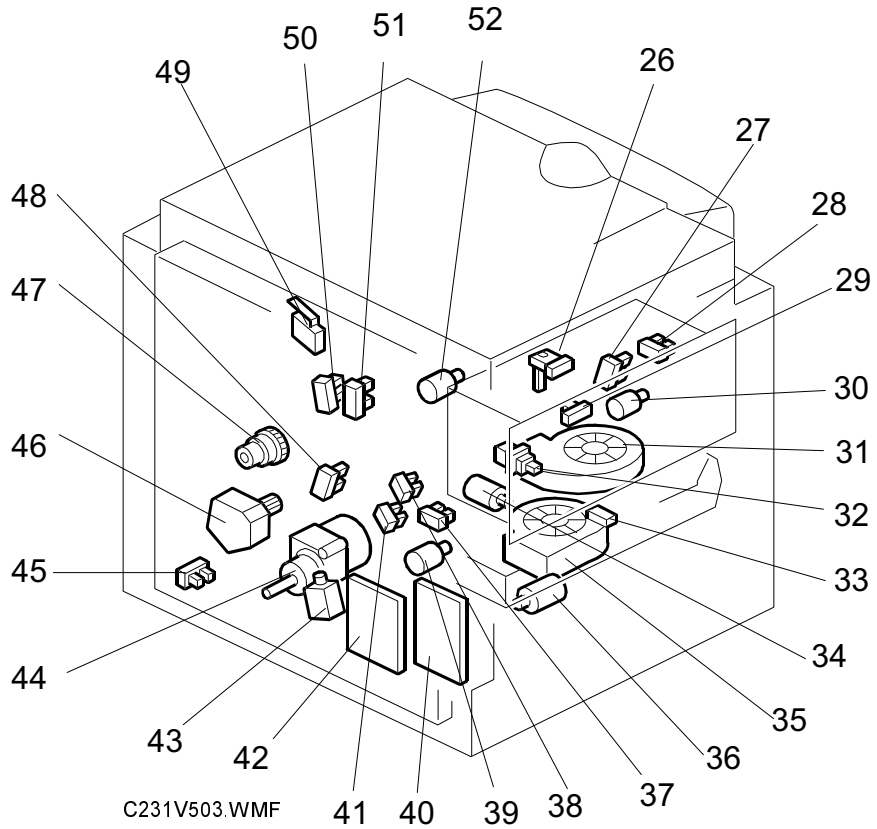
Index No.	Name	Function
3	ADF Cover Switch	Detects whether the ADF cover is open or closed.
5	ADF Switch	Detects whether the ADF unit is open or closed.

Sensors

Index No.	Name	Function
2	Scan Line Sensor	Detects when a page is approaching the auto shading position.
1	Document Sensor	Detects the presence of a document in the feeder.
6	Not Used	

1.5.2 MAIN BODY





Boards

Index No.	Name	Function
2	Main Processing Unit (MPU)	Controls all machine functions both directly and through other boards.
3	Lamp Stabilizer	This supplies power to the xenon lamp.
17	Power Supply Unit	Provides dc power to the system.
25	Operation Panel Boards	These boards control the operation panel.
4	Contact Image Sensor and Xenon Lamp	This sensor reads and converts the light reflected from the document into an analog video signal. It uses an RMLA (Roof Mirror Lens Array) sensor unit. The xenon lamp that illuminates the document is contained in this unit.
40	Noise Filter Board	Filters out electrical noise on the ac power input lines.
42	Main Motor Control Board	Controls the main motor speed.

Motors

Index No.	Name	Function
7	Master Feed Motor	Feeds the master to the drum.
18	Cutter Motor	Cuts the master.
19	Registration Motor	Feeds the paper to align it with the master on the drum.
1	Scanner Motor	Stepper motor drives the book scanner.
30	Master Eject Motor	Sends used masters into the master eject box.
31	Air Knife Fan Motor	Rotates the fan to provide air to separate the leading edge of the paper from the drum.
34	Pressure Plate Motor	Raises and lowers the pressure plate.
35	Vacuum Fan Motor	Provides suction so that paper is held firmly on the transport belt.
36	Paper Transport Motor	Transports the printed paper.
39	Clamper Motor	Opens or closes the drum master clamper.
44	Main Motor	Drives paper feed mechanisms and the drum.
46	Paper Table Motor	Raises and lowers the paper table.
52	Ink Pump Motor	Drives the ink pump.

Solenoids

Index No.	Name	Function
43	Rear Pressure Release Solenoid	Releases the press roller to apply printing pressure.
20	Front Pressure Release Solenoid	Releases the press roller to apply printing pressure.

Switches

Index No.	Name	Function
49	Scanner Unit Safety Switch	Checks whether the scanner unit is properly set.
9	Master Making Unit Cover Safety Switch	Checks whether the cover on the master making unit is properly closed.
16	Table Lowering Switch	Lowers the paper table.
21	Test Switch	Releases the cover safety functions. (See the notes below this table.)
23	Door Safety Switch	Checks whether the front door is properly closed.
24	Main Switch	Turns the power on or off.

NOTE: When you use this test switch, be sure to return it to the default position after servicing.

Sensors

Index No.	Name	Function
50	Master Eject Position Sensor	Detects when the drum is at the master eject position.
51	Paper Exit Timing Sensor	Determines the paper exit misfeed check timing.
48	Feed Start Timing Sensor	Determines the paper feed start timing.
26	Master Eject Sensor	Detects used master misfeeds.
28	Pressure Plate Limit Sensor	Detects if the pressure plate is in the lowest position.
27	Pressure Plate Home Position Sensor	Detects if the pressure plate is at the home position.
29	Drum Master Sensor	Detects if there is a master on the drum.
32	Eject Box Set Sensor	Checks if the master eject box is set.
33	Paper Exit Sensor	Detects paper misfeeds at the exit.
37	2nd Feed Timing Sensor	Determines the paper misfeed check timing at the paper registration area.
38	Clamper Open Sensor	Detects if the clamper is in the open position.
41	Clamper Close Sensor	Detects if the clamper is in the closed position.
45	Table Lower Limit Sensor	Detects when the paper table is at its lower limit position.

Index No.	Name	Function
5	Platen Cover Sensor	Detects whether the platen cover is open or closed.
6	Scanner Home Position Sensor	Detects when the image sensor is at home position.
8	Master Set Cover Sensor	Checks if the master set cover is set.
10	Master End Sensor	Informs the CPU when the master making unit runs out of master roll.
11	Paper Height Sensor	Detects when the paper table reaches the paper feed position.
13	Paper Registration Sensor	Detects paper approaching the registration roller.
15	Paper End Sensor	Informs the CPU when the paper table runs out of paper.
14	Cutter Home Position Sensor	Detects when the cutter is at the home position.

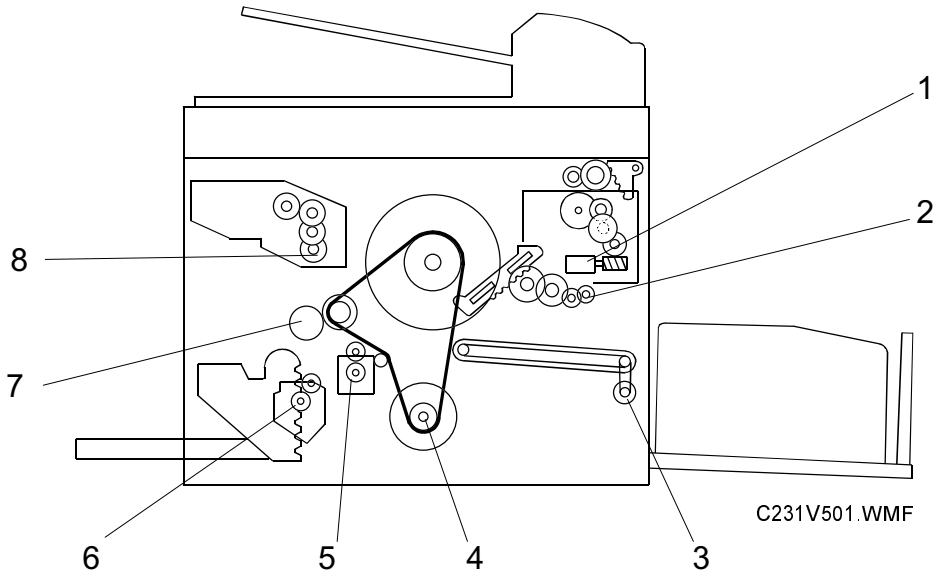
Counters

Index No.	Name	Function
22	Paper and Master Counters	Keep track of the total number of copies and masters made.

Others

Index No.	Name	Function
47	Paper Feed Clutch	Transmits main motor drive to the paper feed roller at the appropriate time.
12	Thermal Head	Burns the image onto the master.

1.6 DRIVE LAYOUT

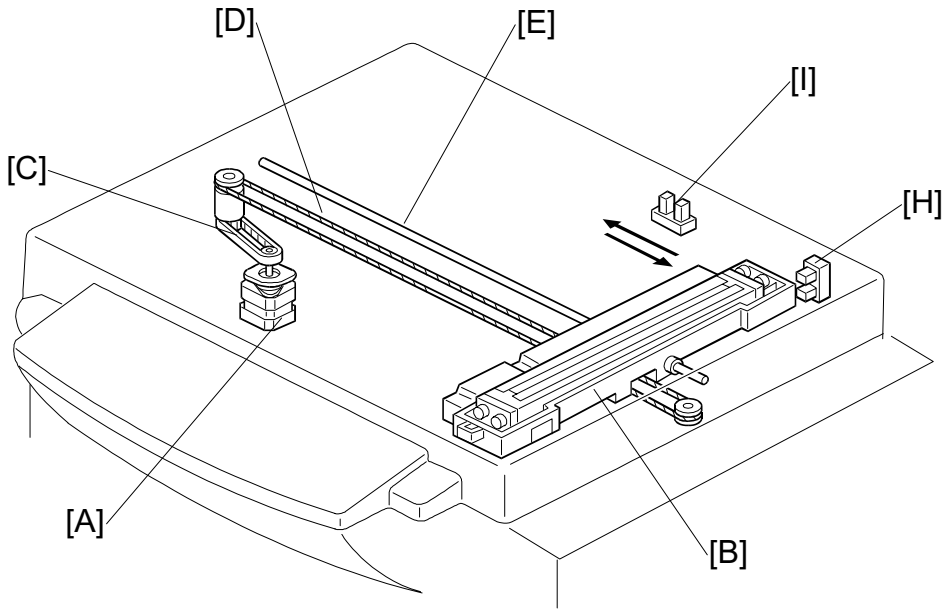


1. Pressure Plate Motor
2. Clamper Motor
3. Paper Transport Motor
4. Main Motor
5. Registration Motor
6. Paper Table Motor
7. Paper Feed Clutch
8. Master Feed Motor

2. DETAILED SECTION DESCRIPTIONS

2.1 SCANNER AND OPTICS

2.1.1 BOOK SCANNER OVERVIEW



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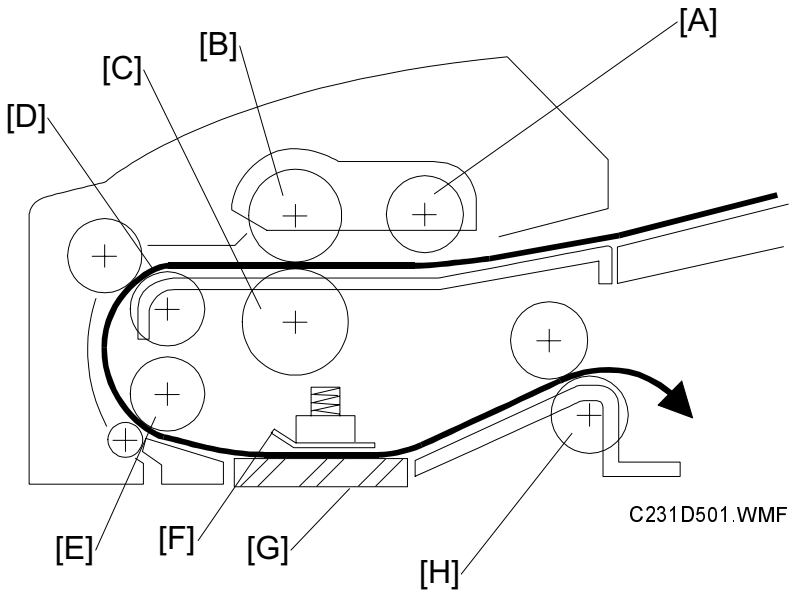
The scanner motor [A] drives the scanner [B] through the timing belt [C] and drive wire [D]. The shaft [E] guides scanner movement in the sub-scan direction. Inside the scanner [B] are a contact image sensor (containing a sensor element and xenon lamp) and a xenon lamp driver.

The scanner [B] consists of a contact image sensor and a xenon lamp driver.

The scanner home position sensor [H] allows the scanner return to the same position after scanning.

The platen cover switch [I] detects the cover status.

2.1.2 ADF OVERVIEW



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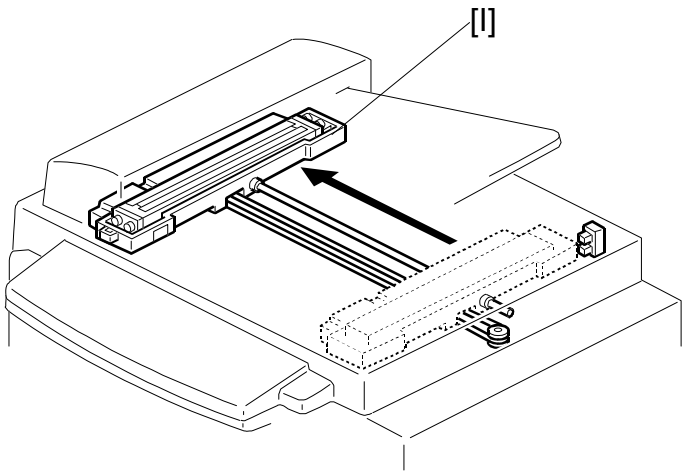

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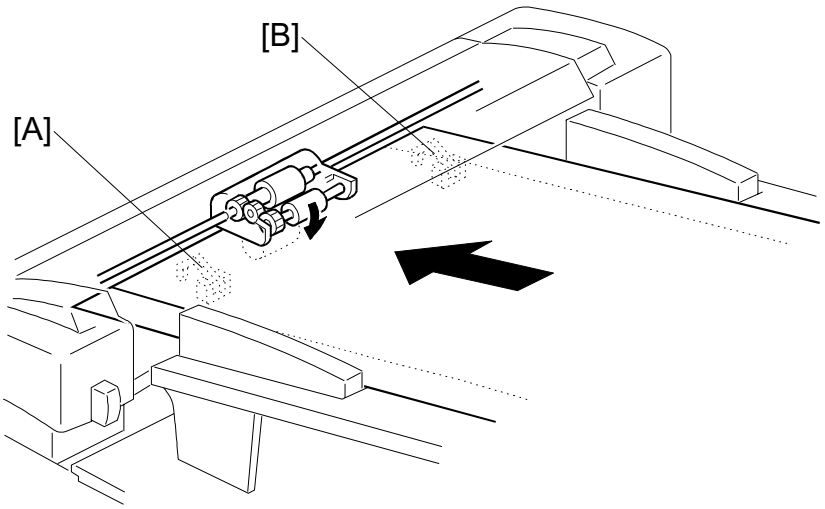
The sheet through-type ADF feeds the document from the top of the document stack.

The pick-up roller [A] and feed roller [B] feed the original into the scanner, and the separation roller [C] helps to feed one sheet at a time. Then, the R0 [D], R1 [E], and R2 [H] rollers feed the document through the scanner.

During scanning, the scanner [I] moves to the scanning position under the exposure glass [G]. The shading plate [F] secures the document at the scan line, ensuring the document is within the image sensor's range of focus.

After scanning, the ADF feeds out the document onto the platen cover, and the scanner moves back to its home position.



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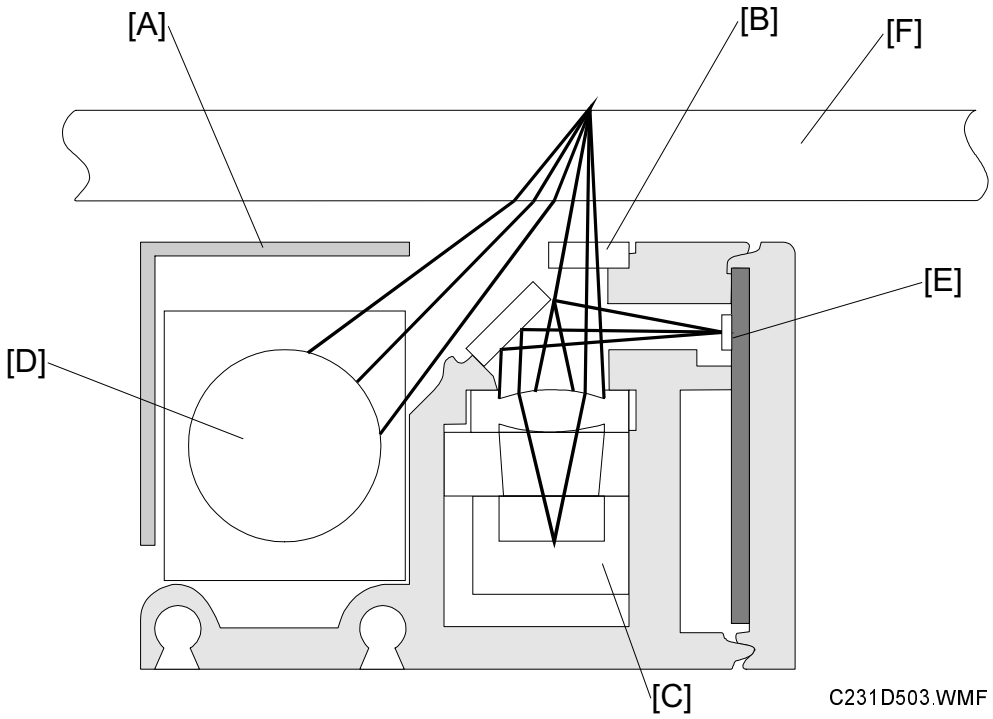
The document sensor [A] detects when an original is placed in the ADF. The sensor [B] is not used in this unit. The ADF is a common part which is used in other models.

2.1.3 CONTACT IMAGE SENSOR



The contact image sensor (CIS) assembly [A] consists of the exposure glass [B], roof mirror lens array [C], xenon lamp [D], and the image sensor [E].
The CIS moves under the exposure glass when scanning a book original, or stays at the ADF scan line when scanning a sheet original using the ADF.

The image sensor is a row of 4096 photosensitive elements (B4 width x 16 dots/mm). The roof mirror lens array focuses the light reflected from the document onto the image sensor.

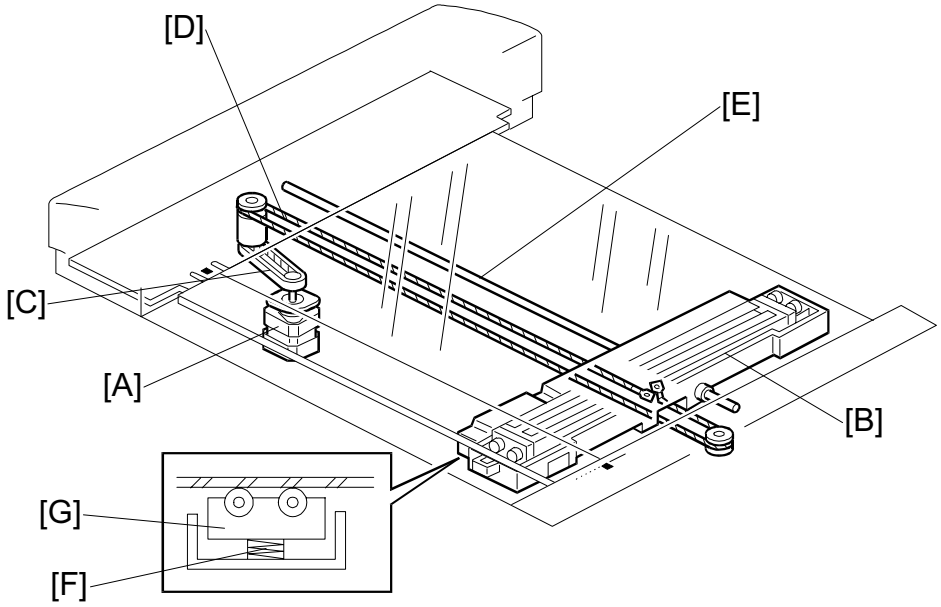
Due to the short optical path of a CIS unit, the focal depth is much shorter than in a CCD type scanner. Because of this, two springs push the CIS against the exposure glass [F], to keep the distance between the CIS and the original constant. In book scanning mode, if the original is out of the CIS focal range, however, the scanned image may be darkened.

NOTE: Due to the characteristics of the CIS, shadows of a paste-up original tend to appear on copies. To counter this, press a key on the operation panel to use the paste shadow erase mode.

The strength of the paste shadow erase level can be increased with SP no. 28.

2.1.4 DRIVE MECHANISM

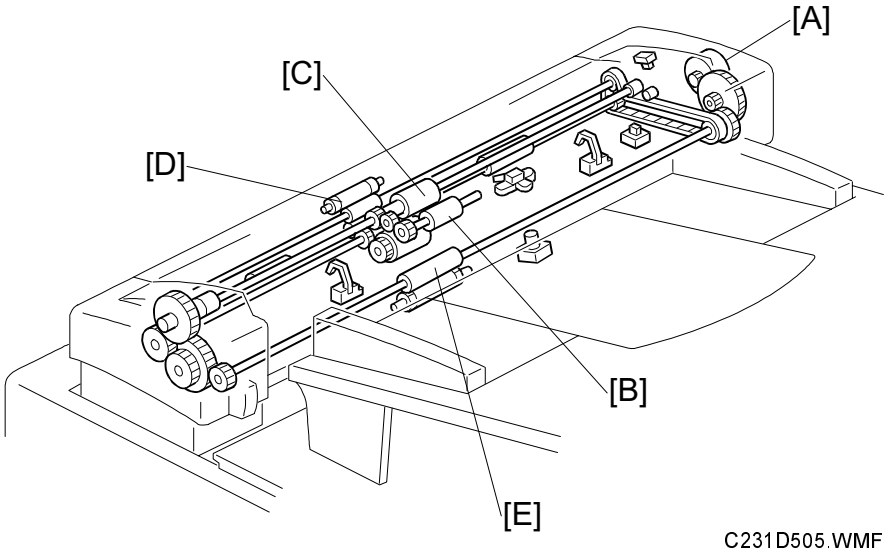
Book Scanner



The book scanner motor [A] drives the scanner [B] via a timing belt [C] and drive wire [D]. The scanner moves along the guide shaft [E].

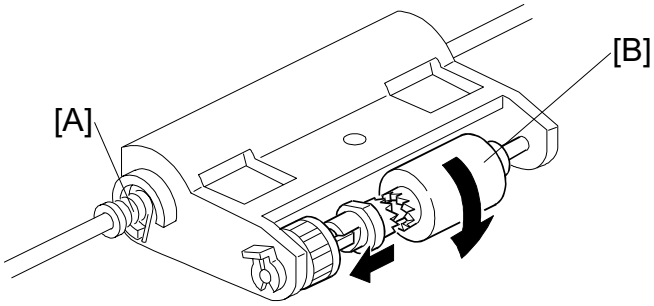
The springs [F] apply pressure to the contact image sensor [G] to ensure that the distance from the image sensor to the exposure glass surface remains constant during scanning.

ADF

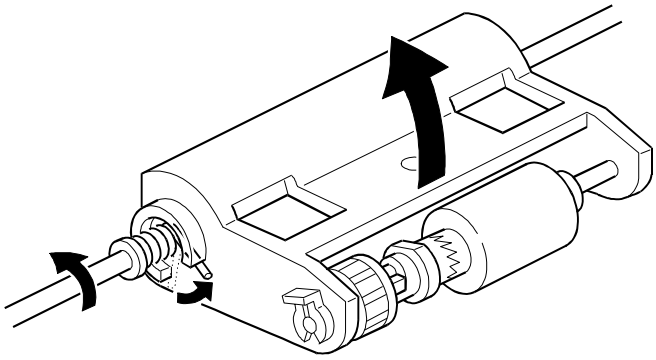


The ADF motor [A] drives the pick-up roller [B], the feed roller [C], the R0 roller [D], the R1 roller (this is obscured in the diagram), and the R2 roller [E].

2.1.5 PICK-UP AND FEED (ADF)



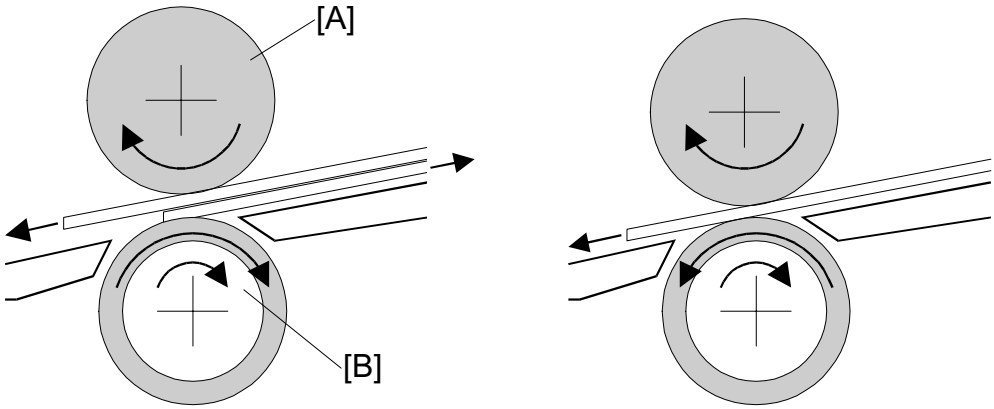
C231D507.WMF



C231D506.WMF

When the ADF motor starts, the mechanical clutch [A] engages and lowers the pick-up roller [B] into contact with the document. Then the machine begins feeding the original stack, beginning with the top page. After the last page is scanned, the ADF motor reverses briefly to raise the pick-up roller back to the standby position.

2.1.6 SEPARATION MECHANISM (ADF)



The feed roller [A] and the separation roller [B] prevent more than one sheet of paper from feeding into the scanner at the same time.

When the feed roller feeds a sheet of paper, both the feed and the separation rollers rotate in the feed-in direction. However, if two or more sheets are between these rollers, the separation roller rotates in the feed-out direction to prevent the lower sheet from being fed into the scanner.

2.1.7 ERROR CONDITIONS

Book Scanner

The main CPU detects an error (error code E-13 is displayed) if either of the following conditions occurs.

Condition	Description	Error Code
Home position sensor error condition	The scanner home position sensor does not turn on up to 7 seconds after the motor engages.	E-13
	The scanner home position sensor does not turn off up to 4 seconds after power on. Otherwise, when the scanner could not return to the home position within 2 seconds of leaving.	

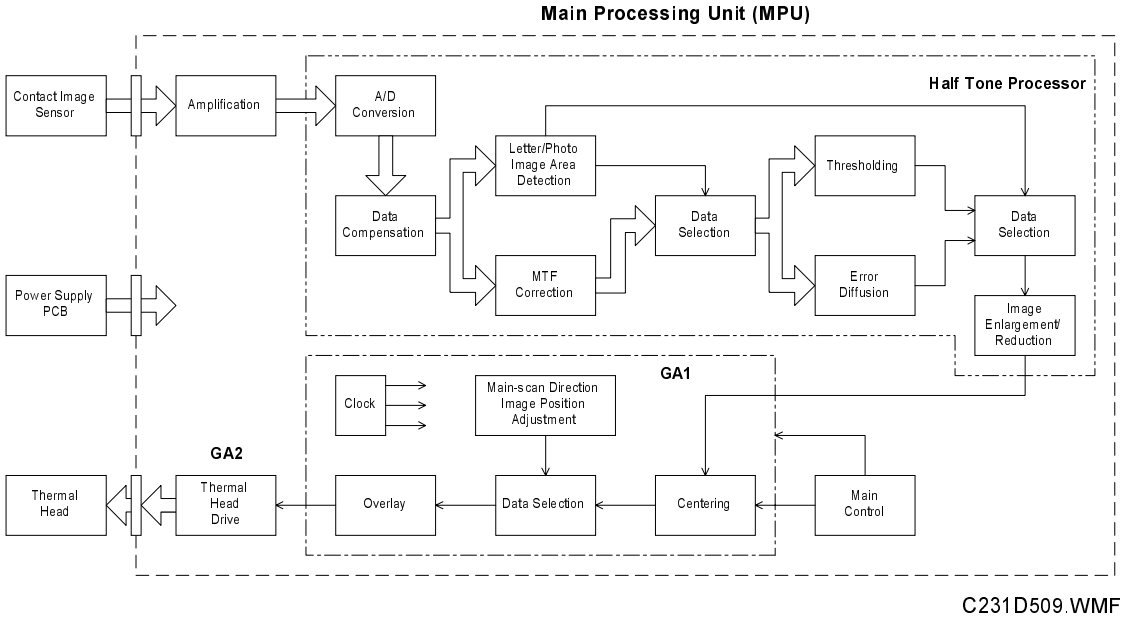
ADF

"Paper feed jam" is displayed if any of the following conditions occurs.

Jam Condition	Description
Non-feed	The scan line sensor does not switch on within 5 seconds after the ADF motor starts.
Misfeed 1	The scan line sensor does not turn off even when the paper (a trial print) reaches the registration area.
Misfeed 2	The ADF motor reverses after the last document feeds out of the scanner or after a jam is cleared. At this time, the misfeed 2 error condition occurs if the document sensor stays on.

2.2 IMAGE-PROCESSING

2.2.1 OVERVIEW



This model uses a contact image sensor (CIS) instead of a CCD. It removes the necessity for the complicated adjustments needed for a CCD scanner.

There are three main chips on the main processing unit (MPU) as shown. The halftone processor chip enables the use of Letter/Photo mode in addition to Letter and Photo modes. In Letter/Photo and Photo modes, error diffusion processing produces better copy quality halftone images.

The halftone processor also includes the A/D conversion function, as well as the image processing functions. The thermal head drive function is built into a chip (GA2) on the MPU.

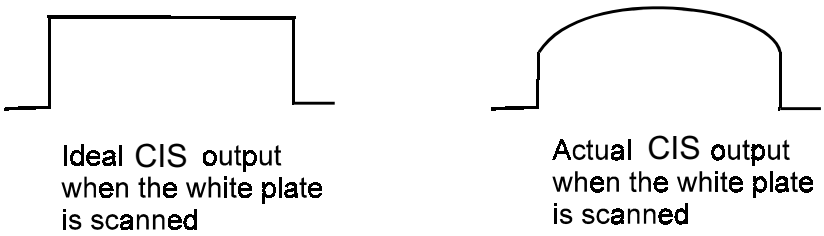
2.2.2 A/D CONVERSION PROCESSING

The analog signal from the contact image sensor is converted into a digital signal that represents 64 grayscale steps. This process is carried out in the halftone processing chip in the MPU.

Shading Distortion Correction

The image data from one main scan line does not exactly represent the line from the original image, because of the following reasons:

1) Loss of brightness towards the ends of the exposure lamp.
2) Variations in sensitivity among elements of the contact image sensor
3) Distortions of the light path



Such distortions in the image data are corrected when they are converted into digital data.

Before scanning the document, the scanner reads the white plate on the back of the original scale. The output of each contact image sensor element is changed to a 6-bit digital value and stored in the shading distortion memory.

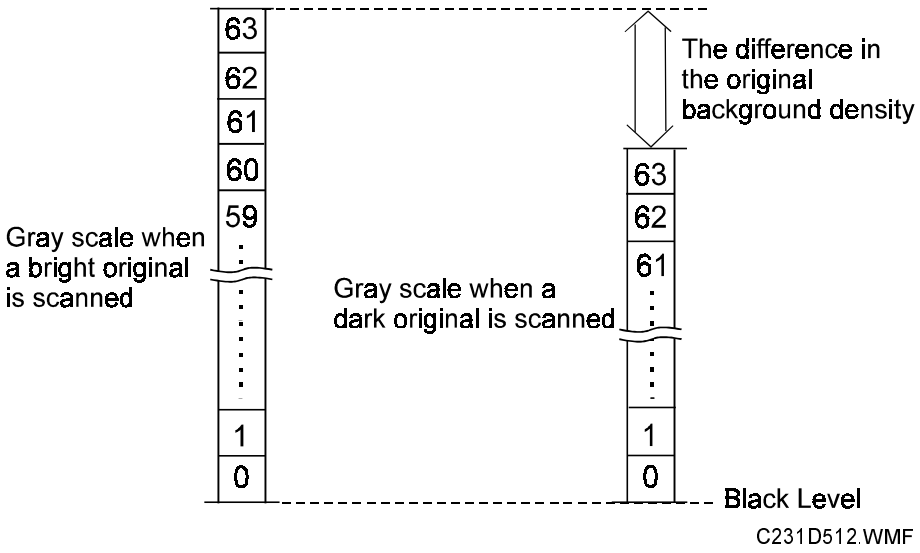
To change the analog shading distortion signals to digital data, a scale of 64 steps is made between the whitest level when the white plate is scanned and 50% of the whitest level. Using this scale, the analog signal is changed to 6-bit digital data.

While an original is scanned, the 6-bit shading distortion value for each pixel is sent in series from memory to the D/A converter, synchronizing with the image signal being sent to the A/D converter. The D/A converter changes the distortion value to an electrical current. The current is converted to the voltage to be used as high reference data for A/D conversion. In this way, the high reference voltage for A/D conversion is changed sequentially for each pixel depending on the shading distortion data for that pixel.

Original Background Correction

When an original is scanned, the whitest level of the original background is stored, and that level is used as the white peak level for A/D conversion. The grayscale is made based on the white peak level of the original. As a result, dark background does not appear on the printout.

If the original background correction is disabled, the whitest level when the white plate is scanned is used for the high reference voltage.



Peak Hold

The peak hold circuit holds the voltage for the white peak level. Before scanning an original, it holds the white peak voltage from the white plate to make shading distortion data. When the original is scanned, it stores the white peak level of the original for the original background correction.

NOTE: The white peak level is checked 5 mm from the leading edge of the original set on the exposure glass (and from the central 147-mm width). If the original leading edge is not flush with the original scale and the platen cover stays open, insufficient voltage will be input as the white peak level. If insufficient voltage is detected, a fixed voltage is used as the white peak level to avoid a faint image copy.

2.2.3 BINARY PROCESSING

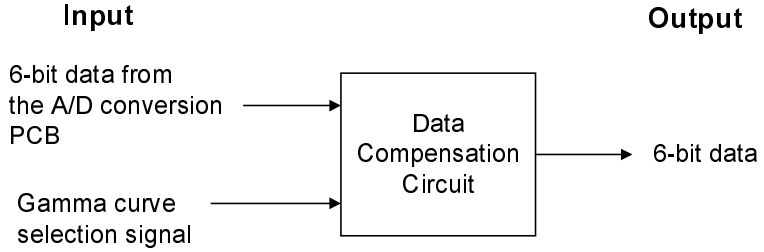
In the halftone-processing chip, the 6-bit digital signal data is generated in the A/D conversion circuit and is sent to the binary processing circuit. At that time the data is inverted to match the binary processing circuit. Therefore, the white peak level becomes 0, and the black level becomes 63.

In the binary processing circuit, the 6-bit data is converted into 1-bit data for black or white pixels. The binary processing for the letter and photo is different, as follows:

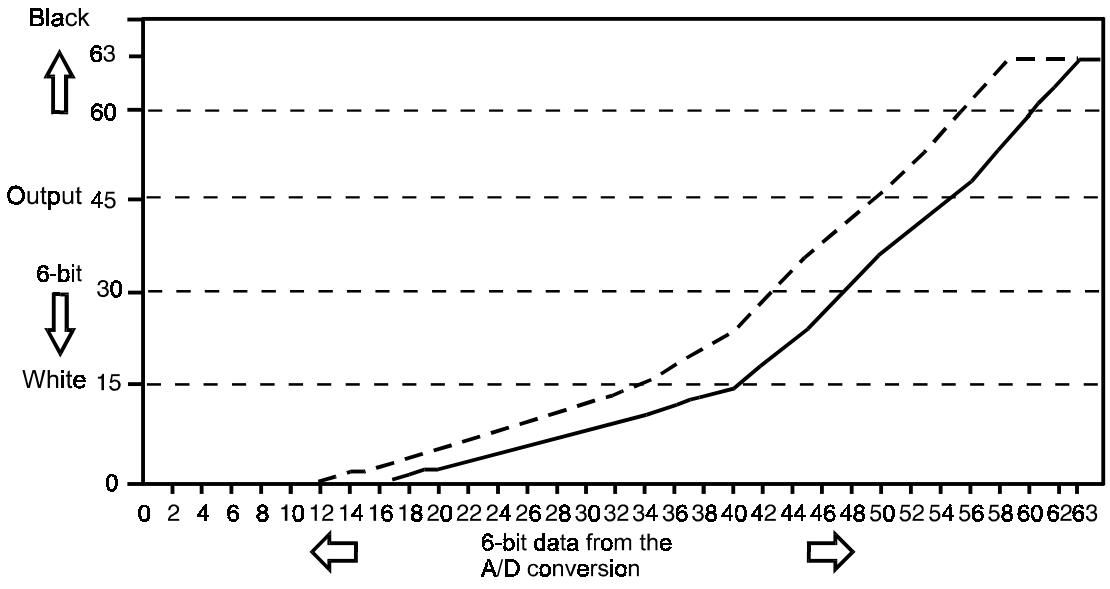
Letter Mode, Letter areas in Letter/Photo Mode: MTF (Modulation Transfer Function) Correction
Photo Mode, Photo areas in Letter/Photo Mode: Error Diffusion Processing

Data Compensation Processing

In this process, the 6-bit data are converted based on a compensation curve (gamma curve) which corresponds to selected image settings. For example, if a darker image is selected, a compensation curve, which converts each pixel value to a higher number, is selected. The output data is still 6-bit.



C231D514.WMF



C231D515.WMF

MTF Correction

When the original image is converted to electrical signals by the contact image sensor, the contrast is reduced. This is because neighboring black and white parts of the image influence each other. This symptom is typical when the width and spacing between black and white areas are narrow. MTF correction counters this symptom and emphasizes image detail. The value of a target pixel is modified depending on the value of surrounding pixels. The modified data are compared with a threshold level. This determines if the pixel is to be black or white.

After the MTF correction is done, the corrected data are compared with the black or white threshold level. If a pixel value is above the threshold level, it is set to black. If the pixel value is equal or below the threshold level, it is set to white. The threshold level depends on the selected density setting.

Image Density Setting	Threshold Level for Line Mode	Threshold Level for Line Areas in Line/Photo Mode
Lighter	28	35
Normal	35	40
Darker 1	38	42
Darker 2	42	44

Binary Processing in Letter/Photo Mode

In the Letter/Photo mode, the machine checks each pixel of the original to see if the pixel is in a letter area or in a photo area. To distinguish letter and photo areas, the CPU does the calculation on the 6-bit pixel data.

If the CPU recognizes that pixel is in a letter area of the image and uses the MTF process to convert the 6-bit value to 1-bit.

If the CPU recognizes that pixel is in a photo area of the image, the pixel is converted to 1-bit using error diffusion.

To emphasize characters in a photo original when using Letter/Photo mode, a data compensation curve (γ curve) is used to make a darker image.

Error Diffusion

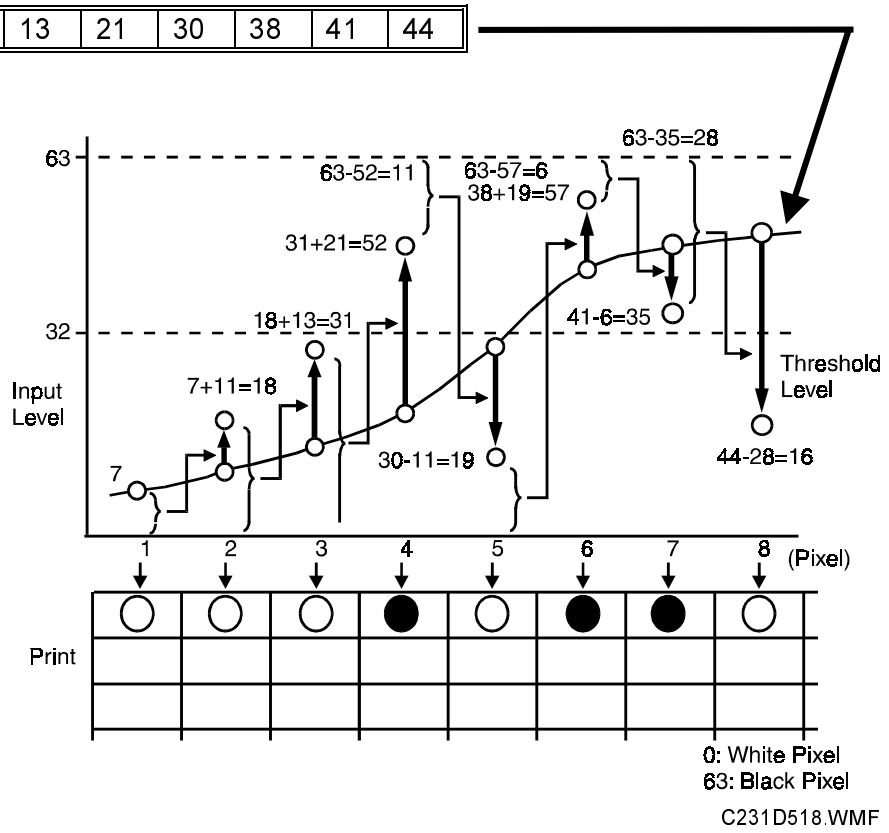
Error diffusion is used to reproduce halftone images in photo mode.

Before a 6-bit image signal is converted into a single-bit signal based on the threshold level, there is a difference between the image signal value and the complete black value (63 for a 6-bit signal) or white value (0). With the error diffusion process, the difference is distributed among the surrounding pixels. (The MTF process simply erases these differences.)

When considering error diffusion in one dimension only (across the page), the 6-bit data shown in the example below produces white and black data output as shown below. In practice, this one-dimensional error diffusion is done in all directions on each pixel (across the page, down the page, etc.).

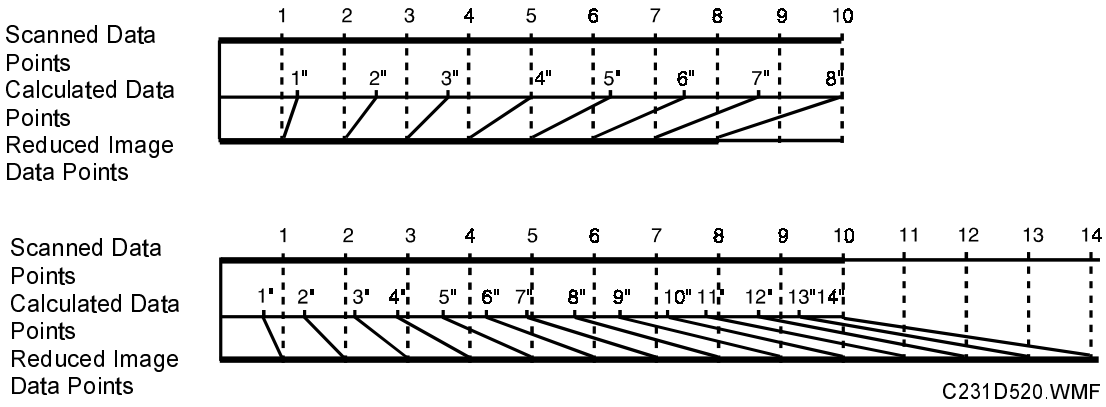
Image data from one scan line

7	11	13	21	30	38	41	44



In each dimension, the difference between the pixel value and the nearest extreme (0 or 63) is transferred to the next pixel. The 1st pixel in the row becomes either black or white, whichever is closest. Then, in the example above, the difference between 7 and 0 is added to the 2nd pixel. The value of the 2nd pixel, which is now 18, is then added to the 3rd pixel. The 4th pixel becomes 52, which is closer to 63 than 0. In such cases, the difference is subtracted (not added) to get the next pixel value. In this example, the difference is 63-52=11, and the next pixel value (30-11) becomes 19.

2.2.4 MAIN SCAN MAGNIFICATION


Scanned Data Points
Calculated Data Points
Reduced Image Data Points
1 2 3 4 5 6 7 8 9 10
1" 2" 3" 4" 5" 6" 7" 8"
Scanned Data Points
Calculated Data Points
Reduced Image Data Points
1 2 3 4 5 6 7 8 9 10 11 12 13 14
1" 2" 3" 4" 5" 6" 7" 8" 9" 10" 11" 12" 13" 14"
C231D520.WMF

Changing the original transport speed does reduction and enlargement in the sub-scanning direction. Reduction and enlargement in the main scanning direction is handled by the magnification and image shift processing circuits.

Pixels for scanning and master making are generated at fixed intervals (the contact image sensor and thermal head element intervals). The image is scanned at the contact image sensor element interval. If pixels on the master are made at the same interval (by the thermal head elements) then the master image is the same size as the original.

When actual pixels are divided in accordance with a magnification ratio, the magnification processor calculates the imaginary points' values that would correspond to new pixels. The proper value for each imaginary point is calculated based on the image data of the surrounding pixel values.

- 80 % Reduction -

For example, the contact image sensor scans data for 10 pixels in a main scan line. Those data are compressed into data for 8 pixels by the magnification processor. As a result, the image is reduced to 80 %.

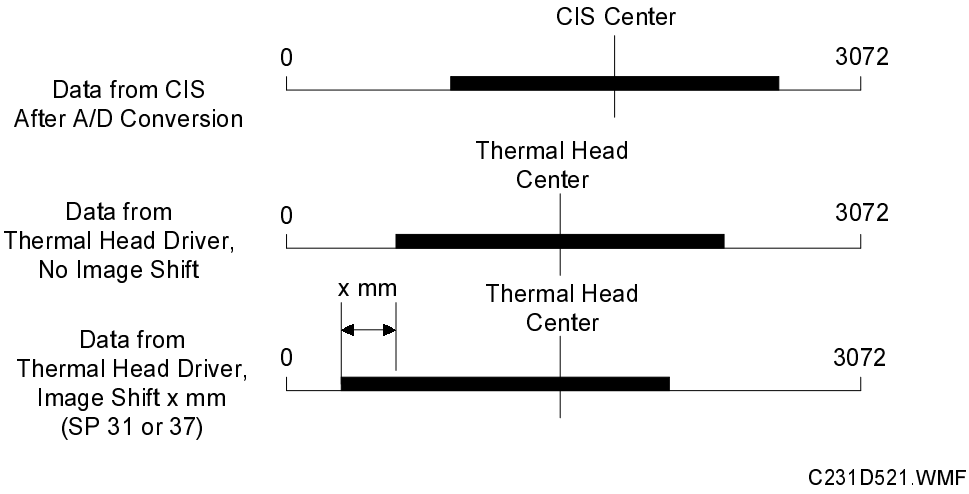
- 140 % Enlargement -

Data for 10 pixels of a main scan line are expanded into data for 14 pixels. As a result the image is enlarged with a 140 % magnification ratio.

2.2.5 IMAGE POSITION ADJUSTMENT IN THE MAIN SCAN DIRECTION

To adjust the image position of the original across the printout, the image can be shifted ± 1.9 mm in the main scan direction using SP mode No. 31 (platen mode) or No. 37 (ADF mode).

The image shift in the main scan direction is done by changing the relationship between the position of the image data on the CIS and on the thermal head. Data for one main scan line are stored in a line memory. When the data is output from memory, the output timing is changed to shift the image.



2.2.6 PASTE SHADOW ERASE MODE

Due to the characteristics of the contact image sensor, shadows of a paste-up original tend to appear on copies. To counter this, the paste shadow erase mode can be used by pressing a key on the operation panel.

When this mode is selected, the black or white threshold level is slightly lowered. At the same time, the emphasis in the sub-scan direction in the MTF correction process is weakened to make the shadows inconspicuous.

The strength of the paste shadow erase level can be increased with SP No. 28.

2.2.7 THERMAL HEAD

Specifications

- Length 260.2 mm
- Number of thermal head elements 3072 dots
- Density of thermal head elements 300 DPI
- Applied voltage Approximately 21 volts

Thermal Head Control

The thermal head has heating elements at a density of 300 dpi. The thermal heating elements melt the over-coating and polyester film layers of the master, according to the image signal for each pixel.

The power supply unit applies power (VHD) to the thermal heating elements. The power source varies from one head to another since the average resistance of each element varies. Therefore, when the thermal head or power supply unit is replaced, it is necessary to readjust the applied voltage with particular values for each thermal head.

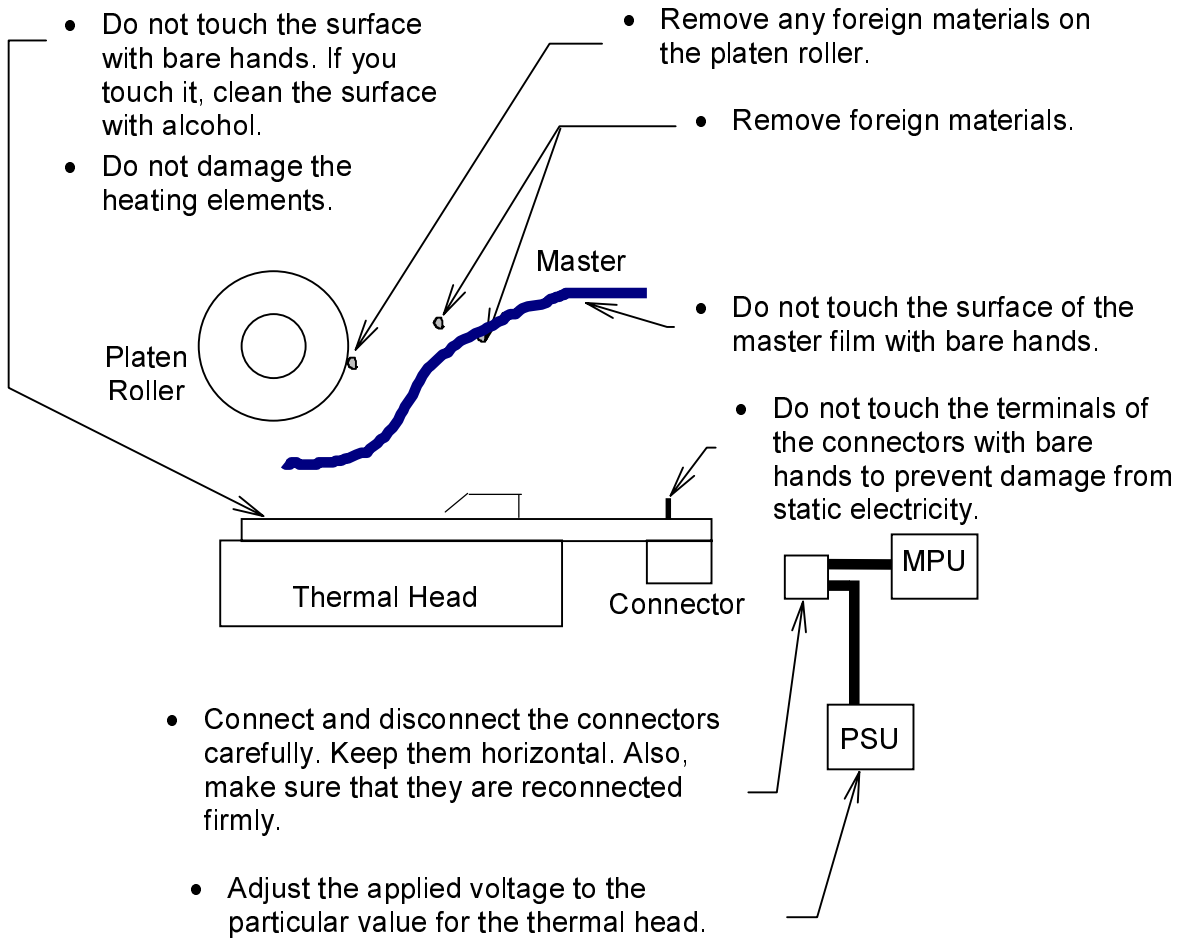
Thermal Head Protection

The thermistor on the thermal head provides thermal head protection, preventing the thermal head from overheating when processing a solid image. The CPU detects any abnormal condition when the Start key is pressed, and displays an SC code on the operation panel as follows:

SC Code	Conditions	Detecting Component
E - 04	Over 54°C	Thermistor
E - 09	Under - 20°C (Normally, this indicates that the thermistor has become open, or a related connector is disconnected.)	Thermistor
E - 10	When the pulse width that controls the thermal head energy becomes abnormal, master making stops and this SC lights.	MPU

Remarks for Handling the Thermal Head

The following remarks must be noted when servicing:

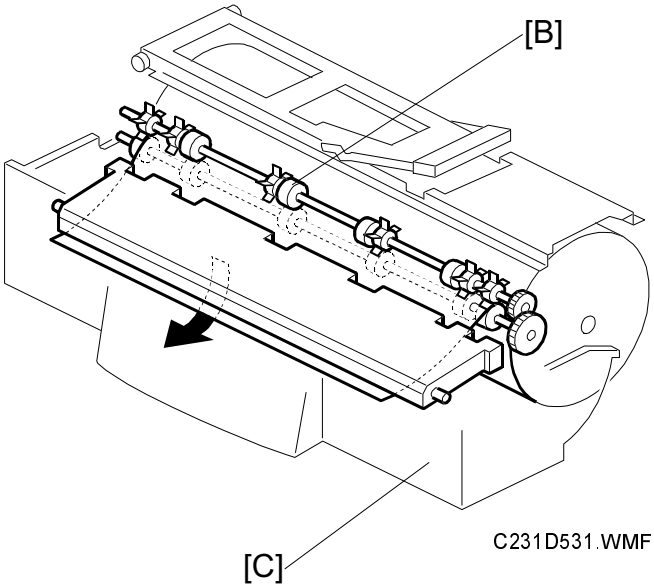

• Do not touch the surface with bare hands. If you touch it, clean the surface with alcohol.
• Do not damage the heating elements.
• Remove any foreign materials on the platen roller.
• Remove foreign materials.
Master
Platen Roller
• Do not touch the surface of the master film with bare hands.
• Do not touch the terminals of the connectors with bare hands to prevent damage from static electricity.
MPU
Thermal Head
Connector
PSU
• Connect and disconnect the connectors carefully. Keep them horizontal. Also, make sure that they are reconnected firmly.
• Adjust the applied voltage to the particular value for the thermal head.

- Other Remarks -

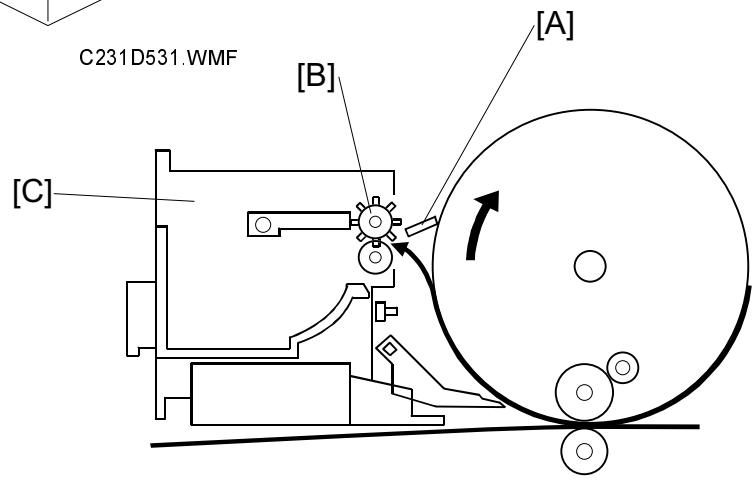
Avoid using the machine under humid conditions. Moisture tends to condense on the thermal head, causing heating element damage.

2.3 MASTER EJECT

2.3.1 OVERALL



C231D531.WMF



C231D530.WMF

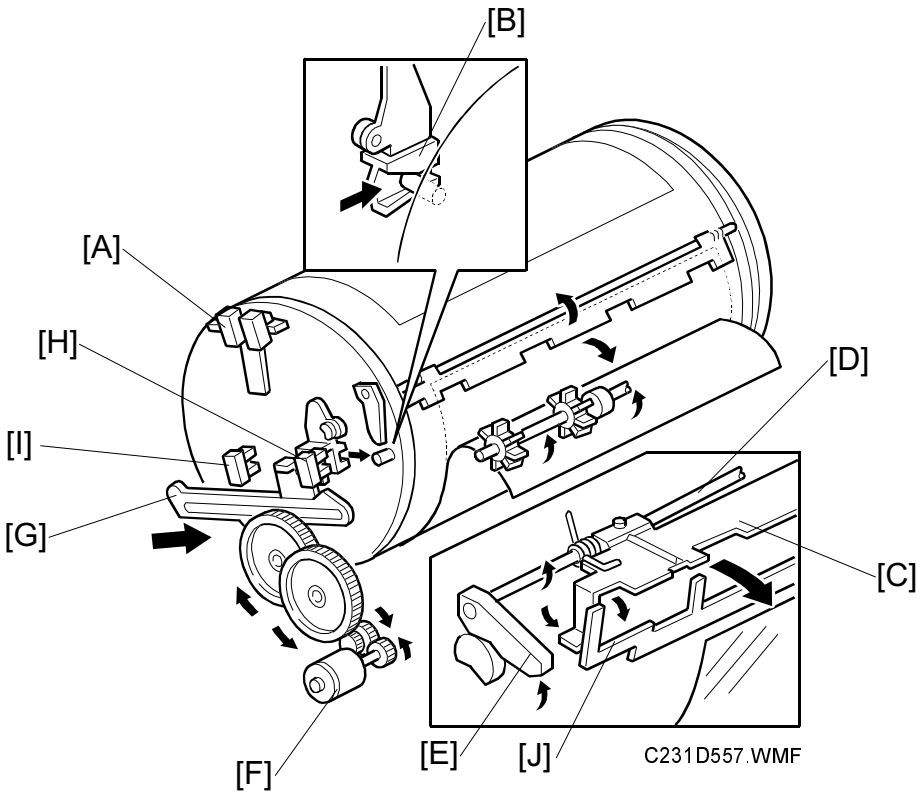
At the end of the printing cycle, the used master remains wrapped around the drum to prevent the ink on the drum surface from drying. When the Master Making key is pressed to make a new master, the used master is removed from the drum.

The machine ensures that the drum is at the master eject position and a master is on the drum by checking the drum master sensor. The master clamper [A] then opens to eject the master. If there is no master on the drum, the machine skips the master eject operation and proceeds to the master making process.

The master eject rollers [B] turn for 0.6 seconds and pick up the master's leading edge. After closing the master clamper, the drum starts rotating at the slowest speed (30 rpm). At the same time the master eject rollers turn and feed the used master into the master eject box [C].

When the drum stops at the master feed position after one and a half turns, the pressure plate drive motor starts turning to compress the used master into the master eject box.

2.3.2 MASTER CLAMPER OPEN MECHANISM



The master eject position sensor [A] ensures that the drum is positioned at the master eject position when the Start key is pressed.

The master clamper has a magnetic plate [C] to secure the master's leading edge in the clamper. The clamper is fixed to the clamper shaft [D], which has a lever [E] at the rear side.

The clamper motor [F] drives the moving link [G] and pushes up the clamper lever [E]. (The link position, the clamper open and close positions, are maintained by the clamper open sensor [H] and clamper close sensor [I].)

The master clamper then lifts the master eject arm [J] to release the master's leading edge from the clamper.

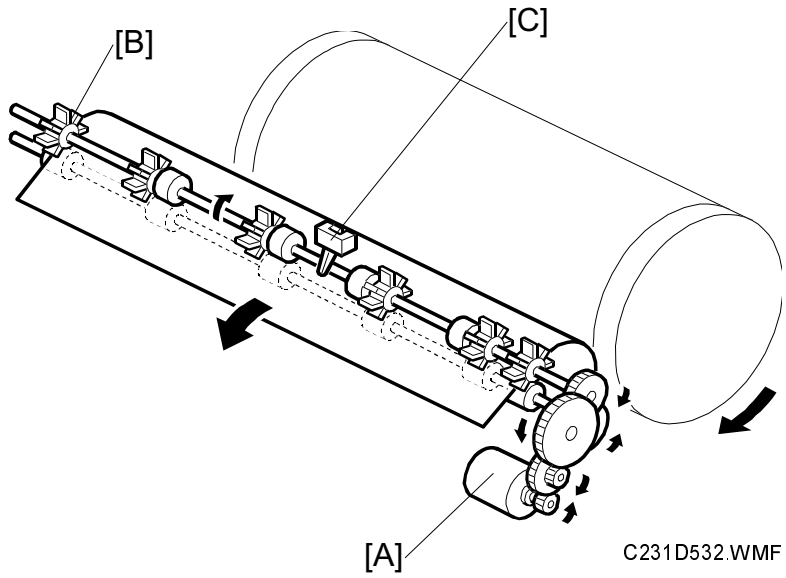
Drum Position Lock Mechanism

When the clamper motor [F] opens the clamper at the master eject position, the drum guide [B] moves and engages the pin on the rear flange of the drum.

The drum guide is moved by the same mechanism that drives the moving link [G]. This means that the drum guide catches the drum at the master eject position while the master clamper is being opened.

When the clamper motor turns on again to close the master clamper, the drum guide also disengages the pin and the drum can now turn.

2.3.3 MASTER EJECT ROLLER MECHANISM



The master eject rollers are driven by the master eject motor [A] through idle gears. The upper eject roller [B] has paddles to assure the master pick-up.

When the master clamper is opened and the master's leading edge is released from the master clamper, the master eject motor turns on for 0.6 seconds to pick up the leading edge of the master.

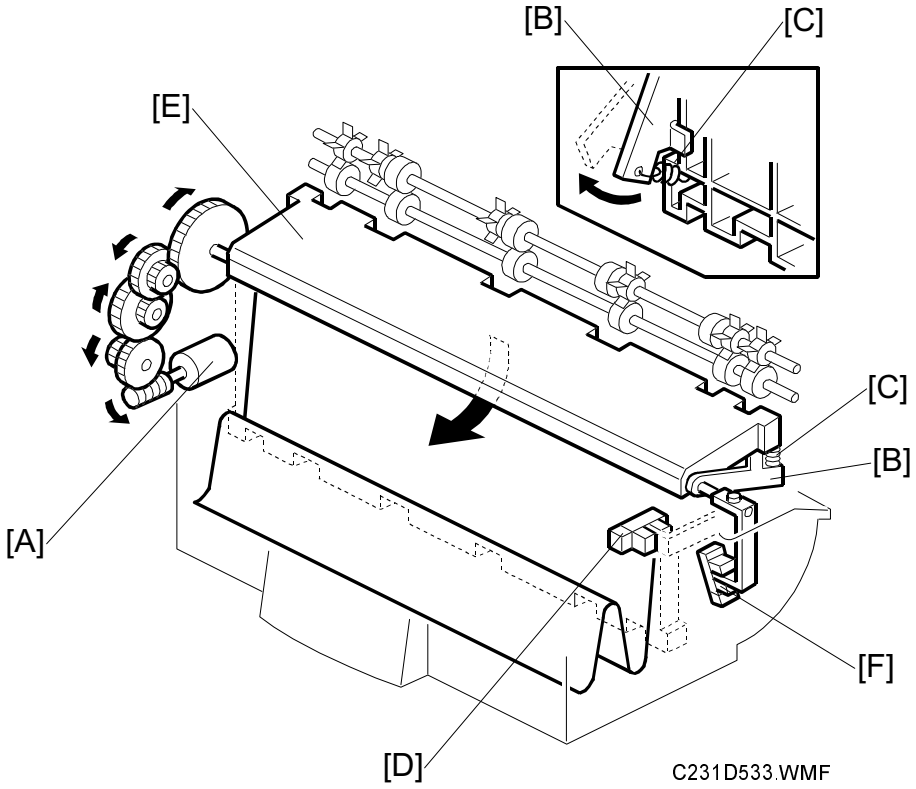
When the master eject motor is turned off, the clamper motor reverses to close the master clamper.

The drum then starts turning at the slowest speed (30 rpm). At the same time, the master eject rollers turn again to feed the master into the master eject box.

After one turn of the drum, the master eject motor stops. The drum turns for an additional half turn, stopping 109 encoder pulses after the feed start timing sensor is actuated (this means that the drum is at the master feed position).

The master eject sensor [C] detects master eject jams.

2.3.4 PRESSURE PLATE MECHANISM



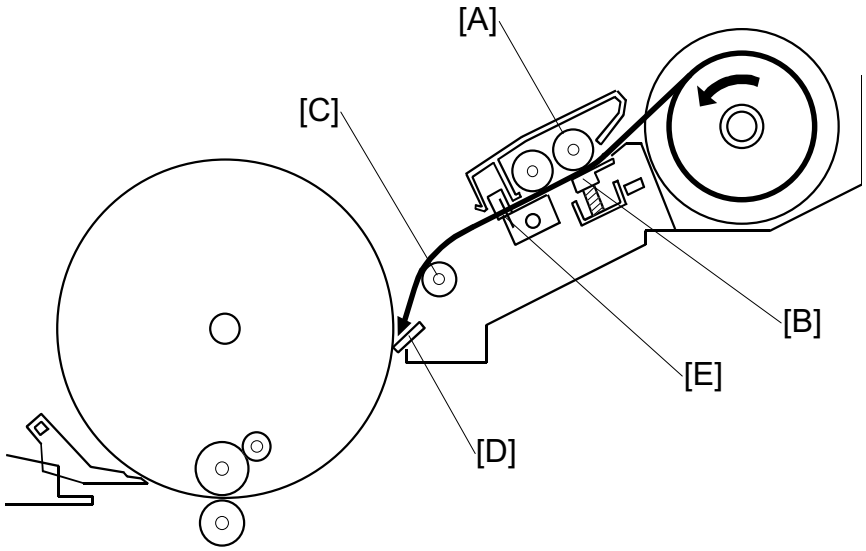
The pressure plate motor [A] drives the pressure plate through the drive arm [B] and the pressure springs [C].

When the master has been ejected into the master eject box, the pressure plate motor turns until the actuator on the pressure plate [E] actuates the pressure plate limit sensor [D]. When the limit sensor is actuated, the motor stops. When master making and cutting are completed, the motor turns in the reverse direction to return the pressure plate to the home position. When the pressure plate home position sensor [F] is actuated, the motor stops.

If the pressure plate limit sensor is not actuated within 2.8 seconds after the pressure plate motor is activated, the machine determines that the eject box is full and that the pressure plate cannot travel any more. In this case, the machine determines that the complete master has been fed into the box and stops the motor (after returning the pressure plate to the home position). The Empty Master Eject Box indicator lights when the drum returns to the home position at the end of the next master making process.

2.4 MASTER FEED

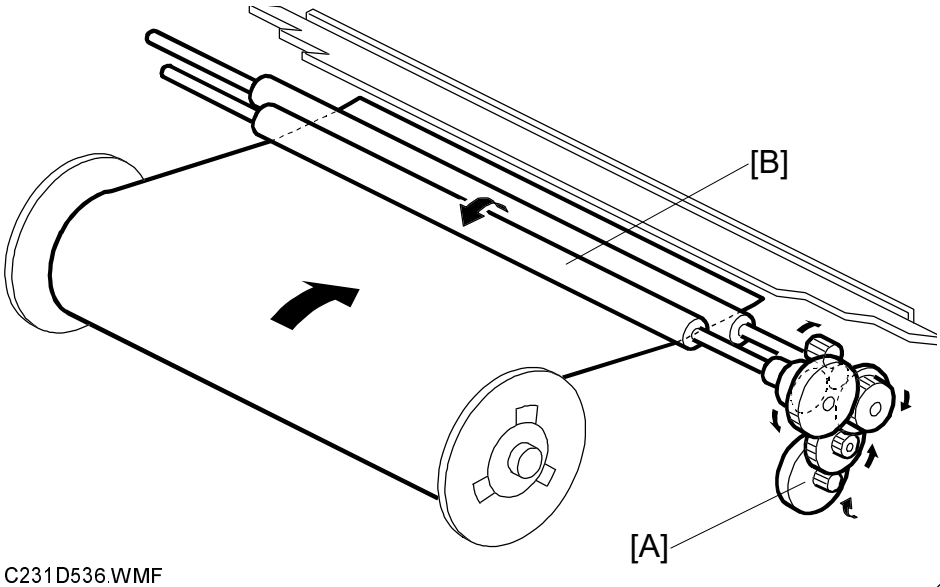
2.4.1 OVERALL



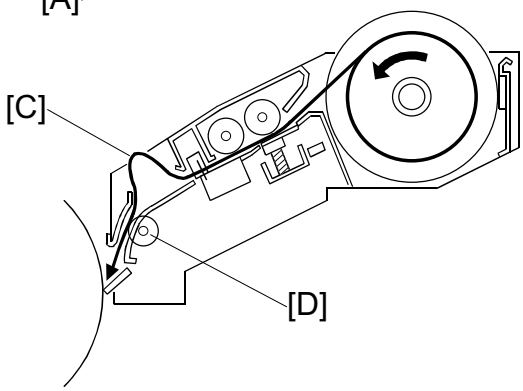
The master is fed by the platen roller [A] while the thermal head [B] develops the image on it. When the drum is at the master feed position and the master clamper is opened, the tension roller [C] is moved away by the master clamper so that the master's leading edge can be fed to the master clamper [D]. The leading edge of the master is clamped by the master clamper, and the master is wrapped around the drum and cut by the cutter [E] to the desired length.

This model uses a new master setting mechanism. This eliminates need for the operator to manually cut the master, unlike the other models.

2.4.2 MASTER FEED MECHANISM



C231D536.WMF



C231D535.WMF

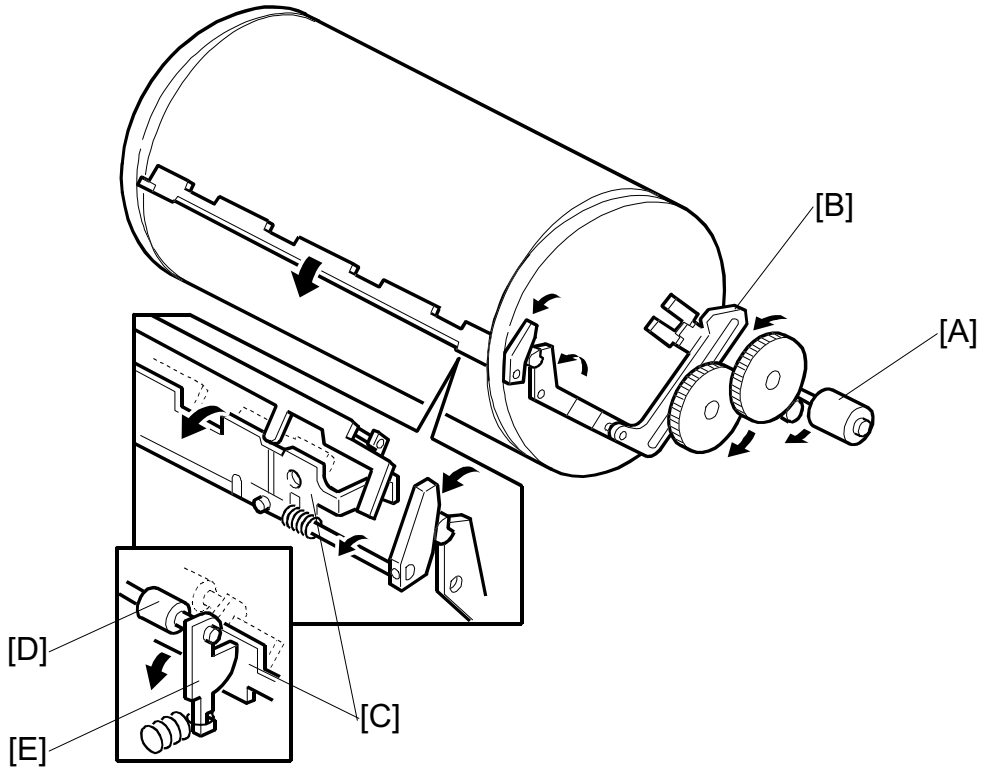
A stepper motor (the master feed motor [A]) drives the platen roller [B]. The thermal head is pressed against the platen roller by the pressure springs. The pressure is applied when the master set cover, which includes the platen roller, is closed.

After the master is ejected, the drum stops at the master feed position and the master clamper opens, ready to clamp the new master.

The leading edge of the master is stopped on the guide plate after the last master cutting operation or after a new master roll has been installed. The master is then fed for 52.4 mm and stopped briefly to synchronize with original feed. The master is fed for a further 67.5 mm before the master clamper is closed. Since the clamper closes after the master's leading edge reaches the clamper, a buckle [C] is made in the master above the master feed guide. This buckle absorbs the shocks from the master clamping operation.

The drum then turns intermittently in the slowest mode (30 rpm) to wrap the master around the drum. The intermittent rotation keeps a buckle in the master above the master feed guide to absorb shocks from the wrapping operation. The tension roller [D] is pressed against the guide plate to keep the master under tension during the master wrapping operation.

2.4.3 MASTER CLAMPER OPERATION AND TENSION ROLLER RELEASE MECHANISM



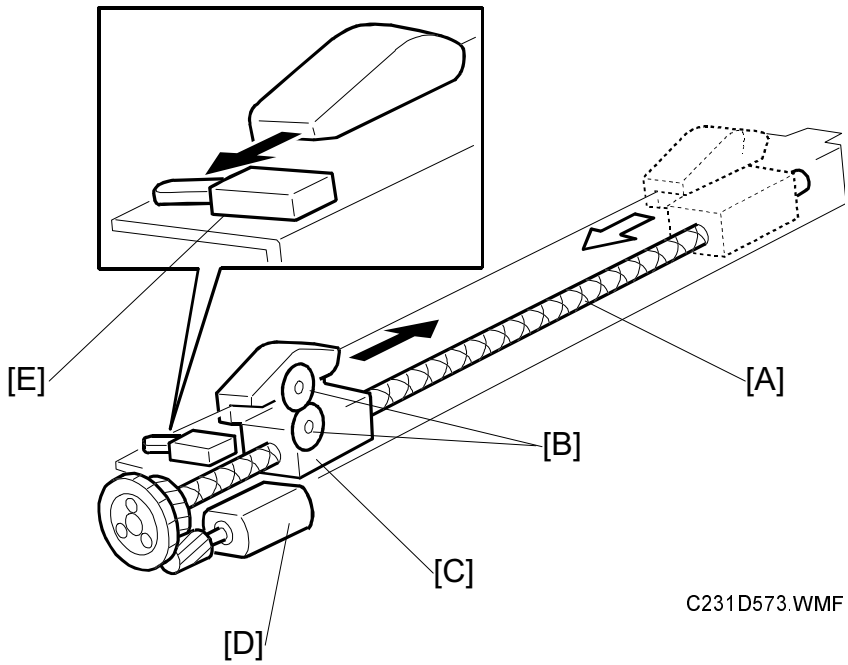
When the master has been ejected, the drum is stopped at the master feed position. At this time, the clamper motor [A] drives the moving link [B] to open the master clamper [C].

The tension roller [D] is normally pressed against the master feed guide plate to apply tension to the master during the master wrapping operation. When the clamper opens, the clamper pushes the tension roller arms [E] and moves the tension roller away from the guide plate to allow the master to be fed into the master clamper.

To close the master clamper, the clamper motor reverses.

NOTE: The clamper open and close sensors maintain the link [B] position. Refer to the Master Eject section for details.

2.4.4 CUTTER MECHANISM



After the master making process finishes, the master feed motor turns off and the cutter starts running to cut the master to the desired length.

The cutter motor [D] drives the screw shaft [A], moving the cutter holder [C] backwards and forwards.

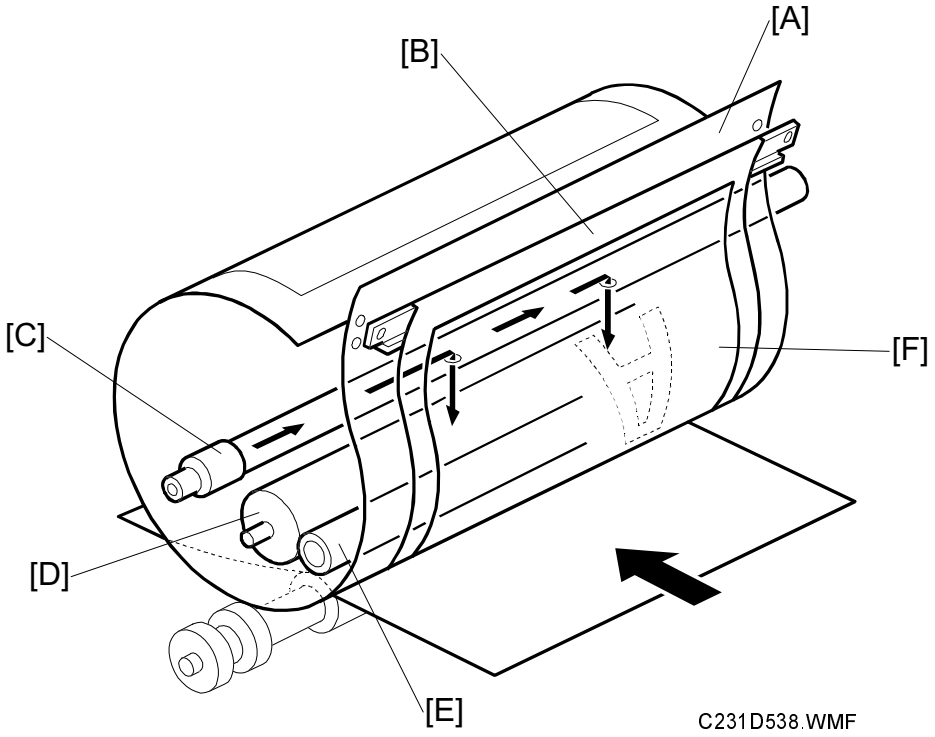
There are two cutter blades [B] in the holder. While the cutter holder [C] travels towards the rear (the non-operation side of the machine), they cut the master. The cuter motor keeps turning in one direction. However the cutter holder returns to the home position when it reaches the rear end of the cutter unit because of the two different spirals threaded on the screw shaft [A].

When the cutter holder reaches the home position, the holder activates the cutter home position sensor [E] and the motor stops.

After the master cut operation, the drum starts turning again to wrap the remaining part of the master around the drum. The leading edge of the master that was cut remains at the cutting position, ready to make the next master.

2.5 DRUM

2.5.1 OVERALL

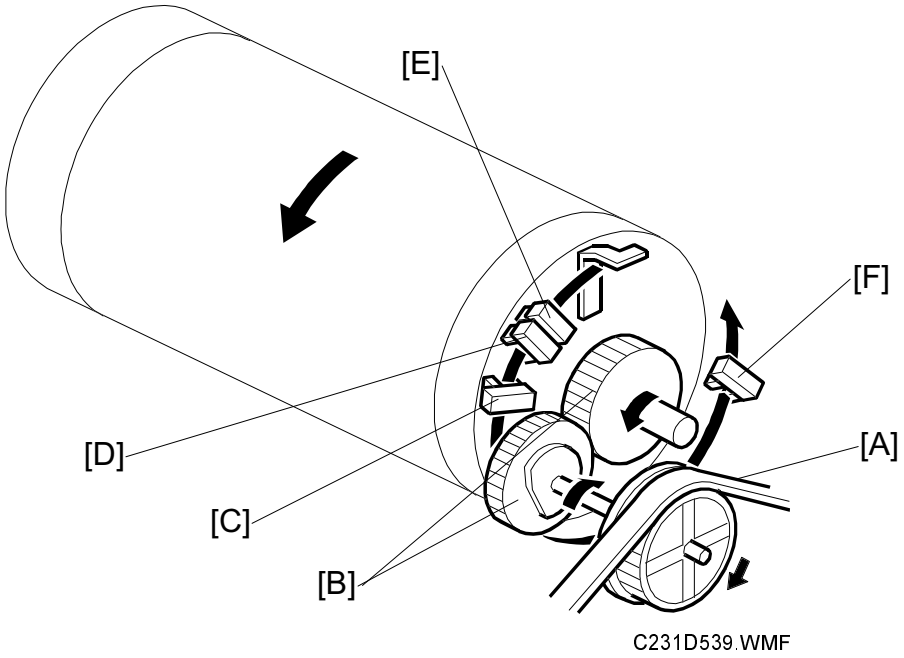


The drum consists of a metal screen [A] and a cloth screen [B].

The ink pump, which is installed inside the drum, supplies ink from the ink cartridge into the drum through the drum shaft [C]. Ink is then evenly spread on the screens by the ink [D] and doctor [E] rollers. Ink passes to the paper through the holes in the master [F], which were made by the thermal head.

The drum is driven by the main motor and turns only clockwise (as viewed from the operator side). The motor speed and the drum stop positions are controlled by monitoring the motor encoder.

2.5.2 DRUM DRIVE MECHANISM



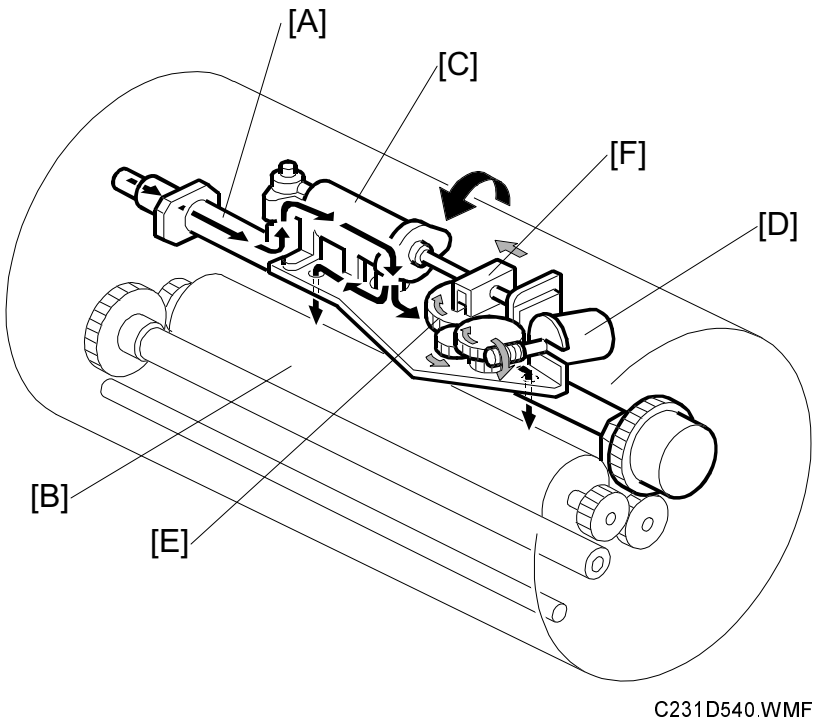
The drum is driven by the main motor (a dc motor) through a timing belt [A] and gears [B]. The main motor has an encoder which sends pulses to the main motor control board. The CPU on the board monitors the pulses and controls the drum speed and stop positions.

The drum has two stop positions: the master eject (drum home) position and the master feed position. These stop positions are determined by checking the feed start timing sensor [C]. The CPU starts counting the main motor encoder pulses when the feed start timing sensor is actuated.

When the drum is stopped at the master eject position, the master eject position sensor [D] is actuated. When the master eject operation is started, the CPU confirms that the drum is at the master eject position by checking this sensor.

There are other two sensors that check the drum position. The paper exit timing sensor [E] and 2nd feed timing sensor [F] are used to send the CPU (on the MPU) the paper jam detection timing of the paper exit and the registration area. (The actual jam checking is done by the paper exit sensor and registration sensor.)

2.5.3 INK SUPPLY MECHANISM

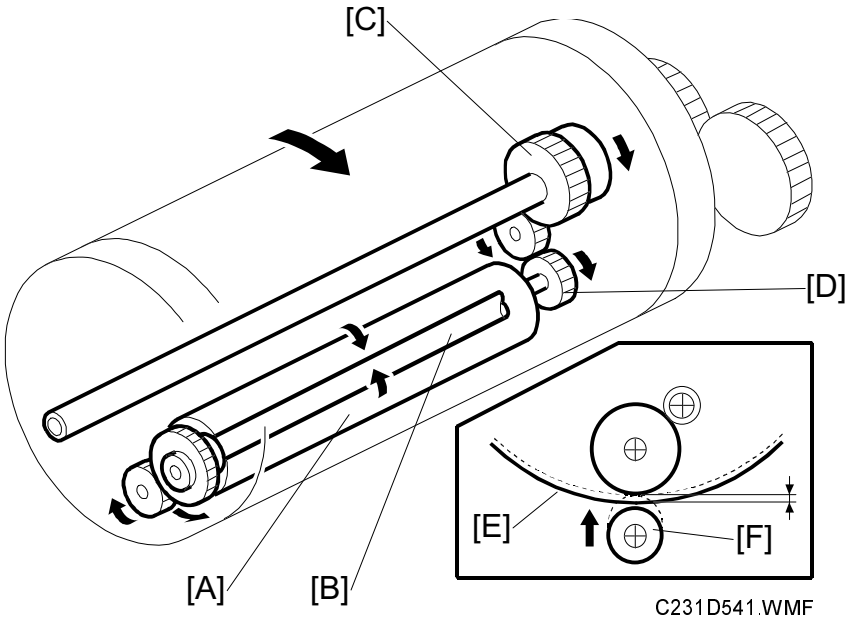


Ink is supplied from the ink cartridge to the ink roller [B] by a pump [C]. The ink pump is driven by the ink supply motor (a dc motor) [D]. There is a pin on the pump drive gear [E] which is coupled with the pin holder [F] on the pump piston shaft. This mechanism converts the gear rotation into piston motion.

Ink drops through the holes in the drum shaft [A] onto the ink roller [B].

NOTE: There are 4 holes in the shaft for the B4 size drum models, and two holes for the Legal and A4 drum versions.

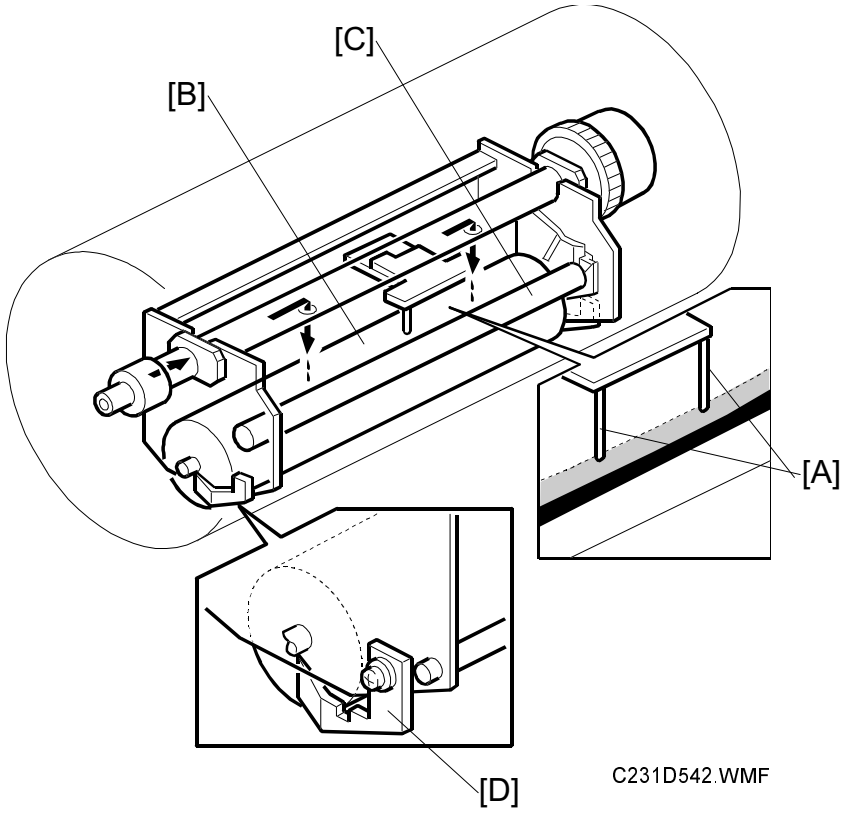
2.5.4 INK ROLLER MECHANISM



The ink roller [A] and the doctor roller [B] are driven by the gear [C] on the drum shaft. Ink on the ink roller is squeezed by the doctor roller to produce an even thickness of ink on the ink roller. The ink roller drive gear [D] has a one-way clutch to prevent the ink roller from being turned in the reverse direction when the drum is manually turned in the reverse direction.

The ink roller does not touch the screen [E] when the machine is not printing. However, during the printing process, the ink on the ink roller is applied to the paper through the holes in the screens and master. This happens when the press roller [F] underneath the drum moves up to press the drum screen and the master against the ink roller.

2.5.5 INK SUPPLY CONTROL



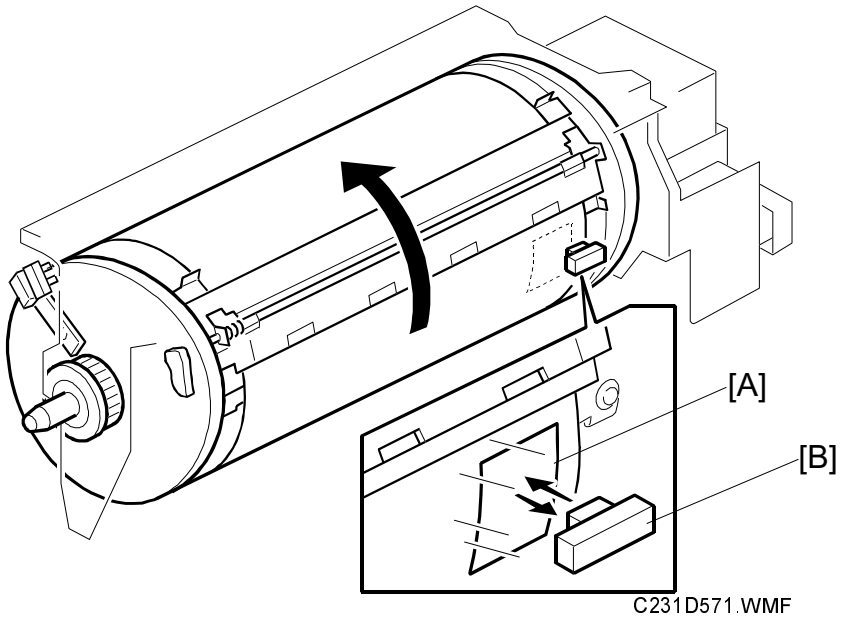
The ink detecting pins [A] work like the electrode of a capacitor and detect the capacitance between the detection pins and the ink [B] and doctor [C] rollers. This capacitance is different when the ink level is high and the pins touch ink, compared to when the ink level is low and the pins do not touch ink. By detecting the capacitance, the ink supply motor is controlled to keep the ink level normal.

If the pins detect an insufficient amount of ink after activating the ink pump motor for 40 seconds, a "no ink condition" is detected. The add ink indicator on the operation panel will light.

NOTE: There is an ink supply mode, which is useful when installing a new drum. When the “Economy Mode” key is pressed while holding down the “0” key, the drum turns 40 rotations, to supply ink inside the drum.

The ink roller blades [D] on both ends of the ink roller scrape off the built-up ink on the ends of the ink roller.

2.5.6 DETECTION OF MASTERS ON THE DRUM



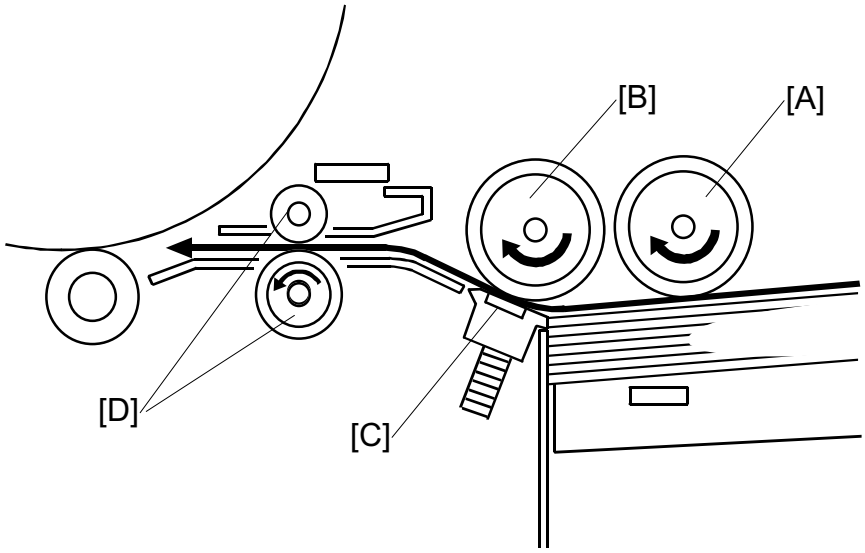
The drum master sensor [B] detects whether a master is on the drum.

When there is a master on the drum, the black patch [A] is covered and the sensor detects the light reflected from the master. Printing starts when the start key is pressed. (If an original is set, the master ejecting starts before making a new master.)

When there is no master on the drum, the black patch [A] is exposed. The black patch does not reflect light back to the sensor. Because of this, the master eject process can be skipped when a new master is made.

2.6 PAPER FEED

2.6.1 OVERALL

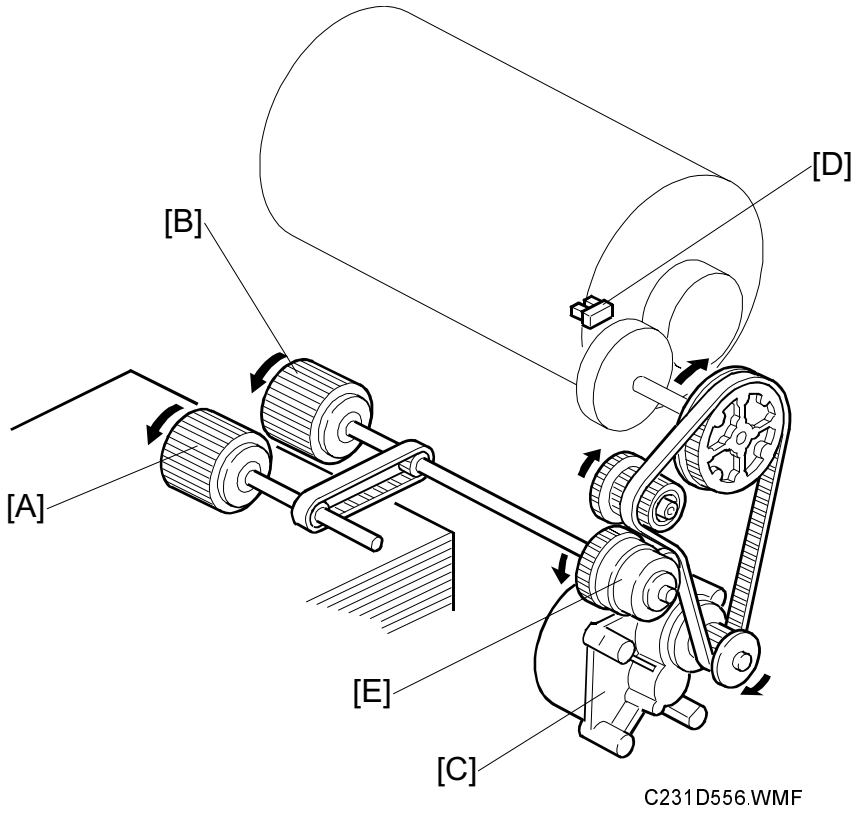


C231D543.WMF

The top sheet of the paper on the paper table is first fed by the pick-up roller [A]. Then, it is separated by the paper feed roller [B] and the friction pad [C], and transported to the registration rollers [D]. The upper and lower registration rollers transport the sheet to the drum.

The paper feed roller is driven by the main motor, and an independent stepper motor is used to control the registration roller. The registration roller synchronizes the paper feed timing with the master on the drum. The registration roller starts rotating after the paper has come into contact with the rollers and has been aligned.

2.6.2 PAPER FEED MECHANISM

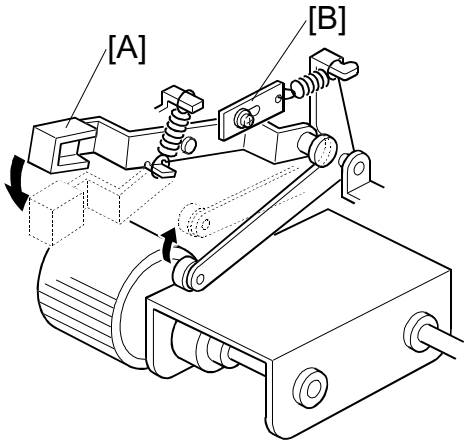


The pick-up roller [A] and paper feed roller [B] are driven by the main motor [C] through gears and a timing belt.

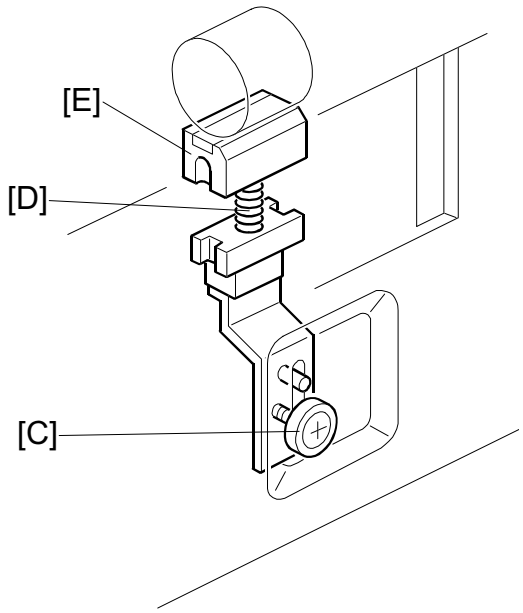
During the printing cycle, when the feed start timing sensor [D] is actuated by the actuator on the drum, the paper feed clutch [E] is energized to transmit the main motor rotation to the paper feed roller shaft. The top sheet of the paper is separated from the paper stack by the friction between the roller and the friction pad [F], and transported to the registration roller.

A one-way clutch is installed in the paper feed roller so that after the electromagnetic clutch is de-energized, it does not disturb the paper transportation.

2.6.3 PAPER FEED/SEPARATION PRESSURE ADJUSTMENT MECHANISM



C231D554.WMF



C231D558.WMF

The paper feed roller pressure can be changed by the operator by changing the position of the pressure adjustment lever [A]. Normally the lever should be in the lower position. If the thick paper (heavier than 127.9 g/m^2 or 34 lb) is used or paper feed jams frequently occur, the lever should be raised to increase the pressure.

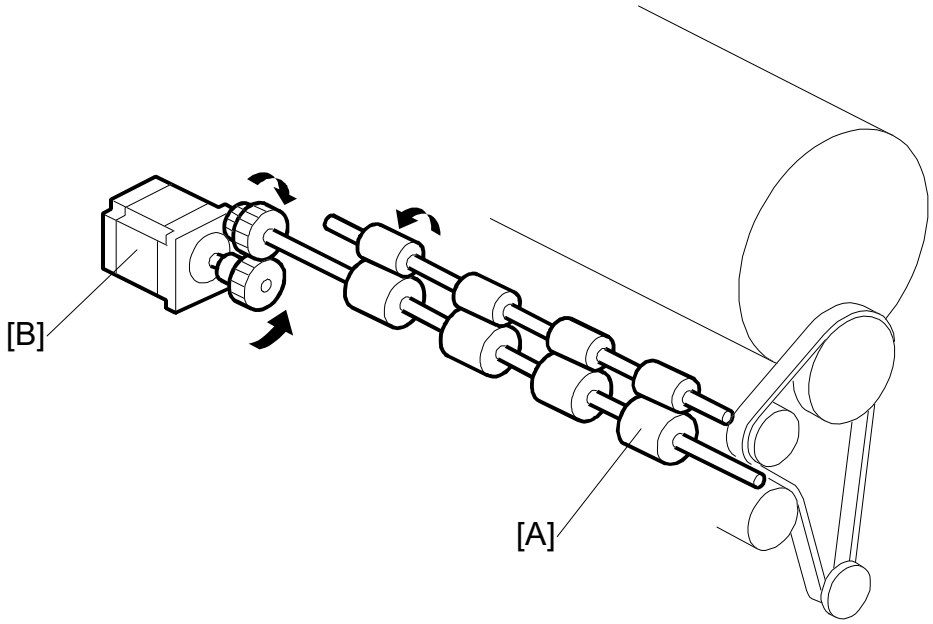
An additional fine adjustment can be done by a technician by changing the position of the feed pressure adjustment plate [B].

If no feed or multi-sheet feed problems still occur, the paper separation pressure can also be adjusted. (This should be done by a technician.)

By loosening then moving up or down the screw [C], the spring [D], which applies pressure to the friction pad block [E], moves up or down.

NOTE: The default position of the screw [C] is the lower-most position.

2.6.4 REGISTRATION ROLLER MECHANISM

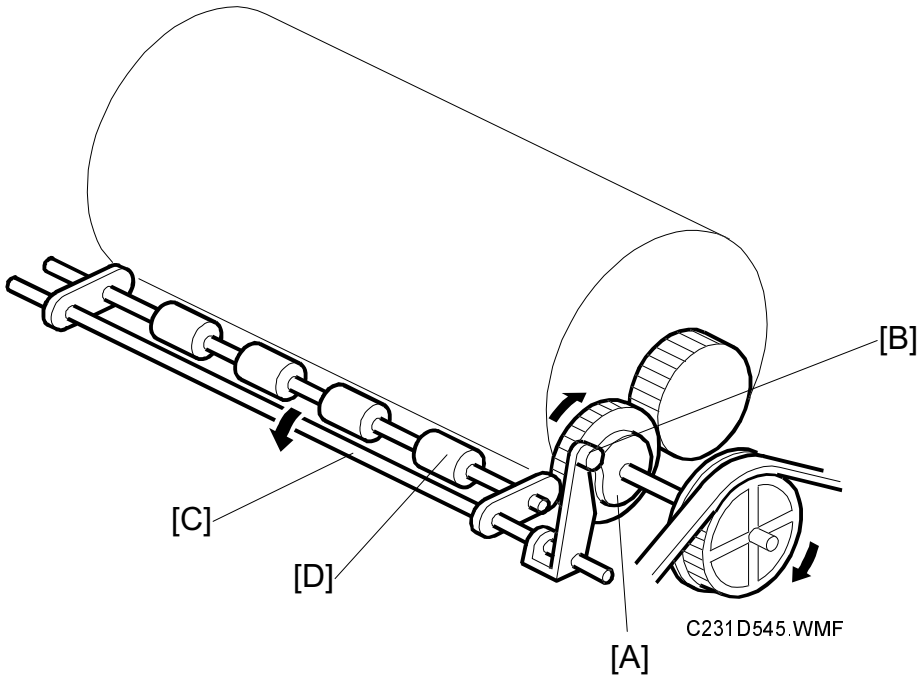


Registration Roller Drive

The lower registration roller [A] is driven by a stepper motor [B] (the registration motor). The CPU controls the registration roller start timing to synchronize the printing paper with the image on the master on the drum.

The stepper motor rotation speed depends on the selected printing speed. By pressing the image position keys on the operation panel, the registration motor start timing is changed.

After the printing paper is caught between the drum and the press roller, the stepper motor stops.

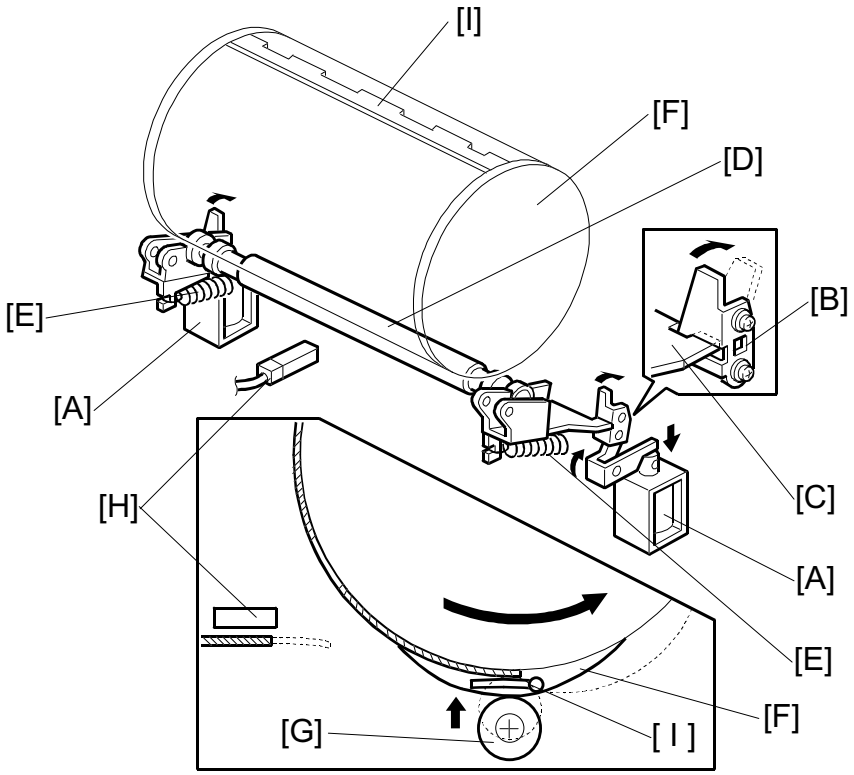


Registration Roller Up/Down Mechanism

After the printing paper is caught between the drum and the press roller, the upper registration roller is released from the lower registration roller. This is to prevent interference from the registration rollers while the paper is transported by the drum and the press roller.

When high point of the cam [A] on the drum drive gear reaches the cam follower [B], the shaft [C] rotates clockwise (as seen from the operation side) to release the upper registration roller [D] from the lower registration roller.

2.6.5 PRINTING PRESSURE MECHANISM



C231D546.WMF

While the machine is not in the printing cycle, the printing pressure release solenoids [A] stay off and the stoppers [B] lock the brackets [C] to keep the press roller [D] away from the drum.

When the 1st sheet of paper is fed, the solenoid is energized but the brackets are still locked by the stoppers due to strong tension from the springs [E]. When the high points of the cams [F] on the front and rear drum flanges reach the cam followers [G] on both sides of the press roller shaft, a small clearance is made between the stoppers and the brackets.

There is one solenoid each on the operation side and non-operation side. The two solenoid plungers are pulled down at the same time releasing the stoppers from the brackets. Printing pressure is applied by tension of the springs when the cam followers come of the high points of the cams.

During the printing cycle, the solenoids stay on. However, if paper does not reach the registration sensor [H] at the proper time (when the cam follower is on the high point of the cam), the solenoids are de-energized to lock the brackets.

The printing pressure is released when the cams push down the cam followers so that the press roller does not contact the master clamper [I].

After printing is finished, the solenoids are de-energized and the stoppers return because of the tension of springs. Before the drum returns to the home position, the bracket is locked by the stopper again when the cams push down the cam followers.

2.6.6 PAPER TABLE MECHANISM

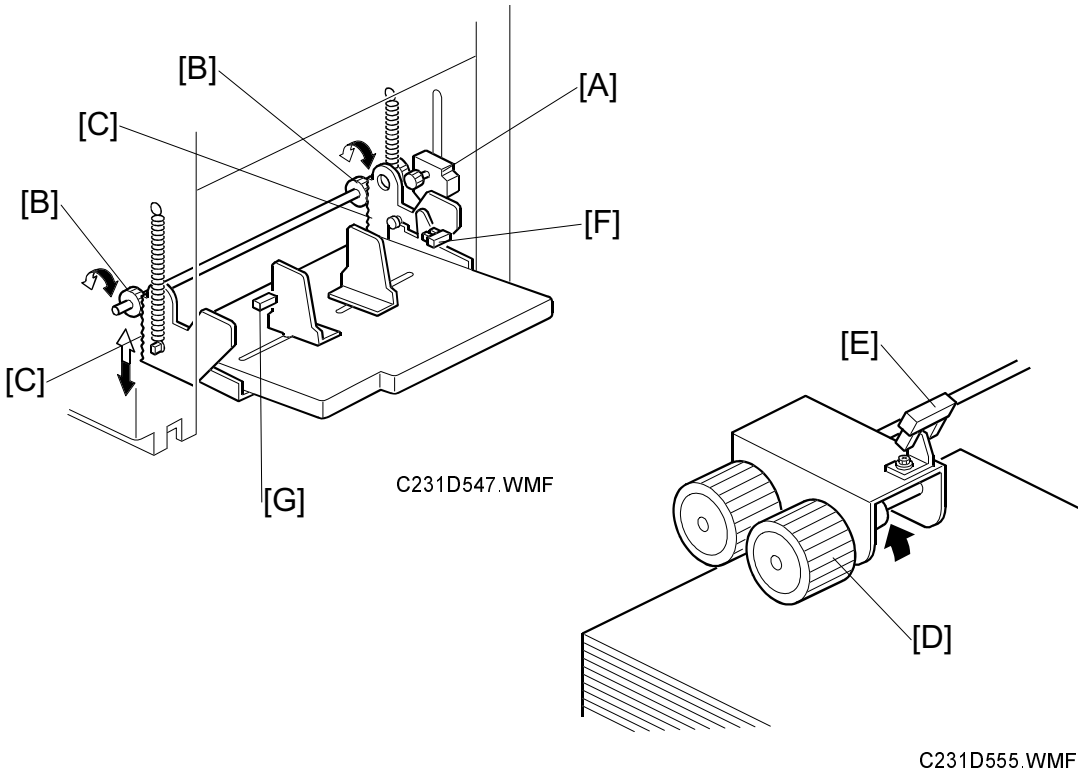


Table Up and Down Mechanism

An independent dc motor, the paper table motor [A], drives the paper table. When the motor turns, the pinions [B] turn on the racks [C], lifting up or lowering the paper table.

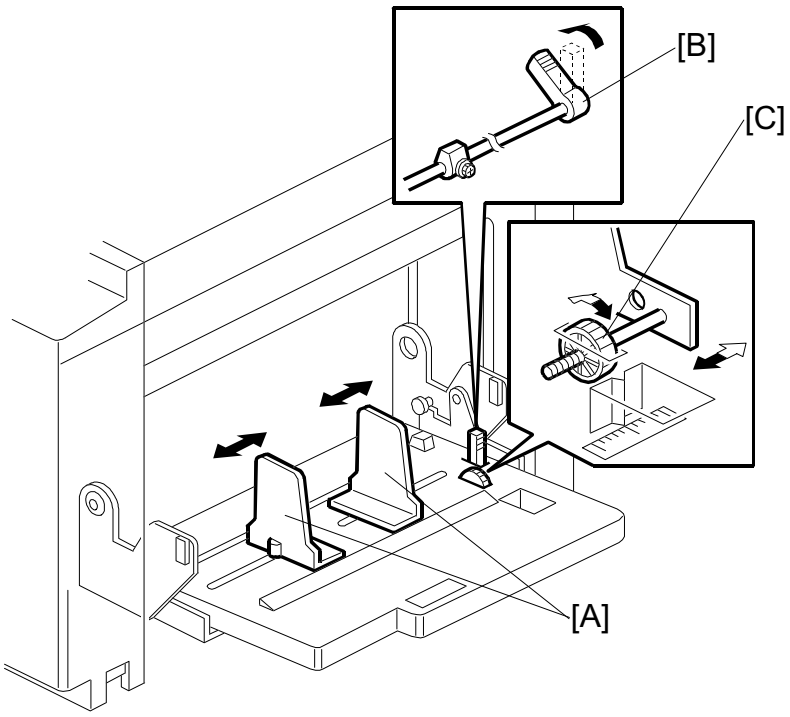
When the paper table moves up, the top of the paper stack contacts the pick-up roller [D], lifting it up. Then, when the paper height sensor [E] is actuated, the paper table stops.

During a printing run, the sheets of the stack are fed, lowering the pick-up roller position. When the paper height sensor is de-actuated, the paper table motor starts turning and raises the paper table until the sensor is actuated again. In this way, the top of the paper stack is kept at the same position during printing.

When the tray lowers, the lower limit position is detected by the lower limit sensor [F], which is beside the paper table motor.

Paper End Detection Mechanism

The paper end sensor [G] is under the paper table to detect when the paper on the table runs out.



C231D548.WMF

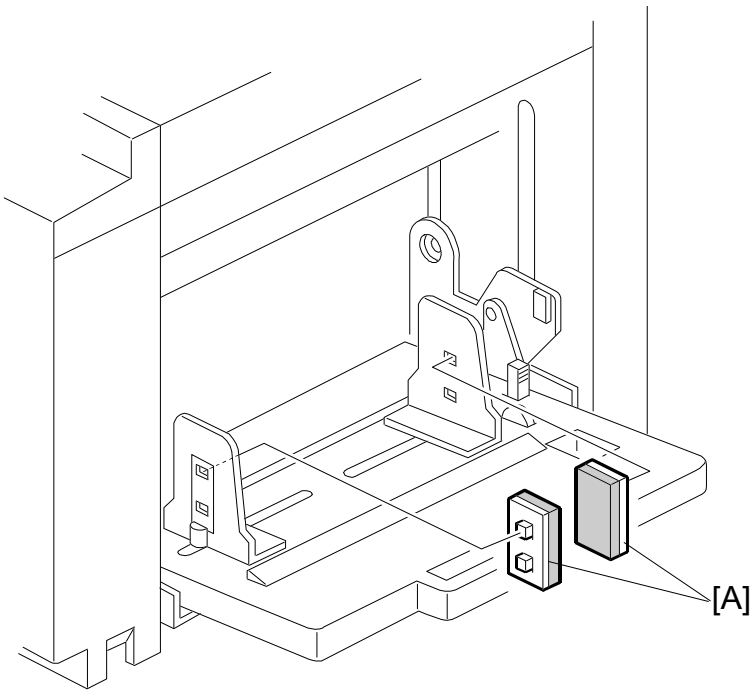
Paper Table Side Fence Mechanism

The left and right side fences [A] move together due to a rack and pinion mechanism. There is a lock lever [B] to hold the side fences in position.

NOTE: The lock lever may be useful if there is no dedicated operator and some of the operators cannot set the side fences properly, causing paper feed problems. Advise the operator to use the lock lever once the paper fences are properly adjusted.

Paper Table Side-to-Side Shift Mechanism

The paper table shifting dial [C] shifts the image across the page. If the dial is turned, the whole paper table moves towards one side or the other.



C231D559.WMF

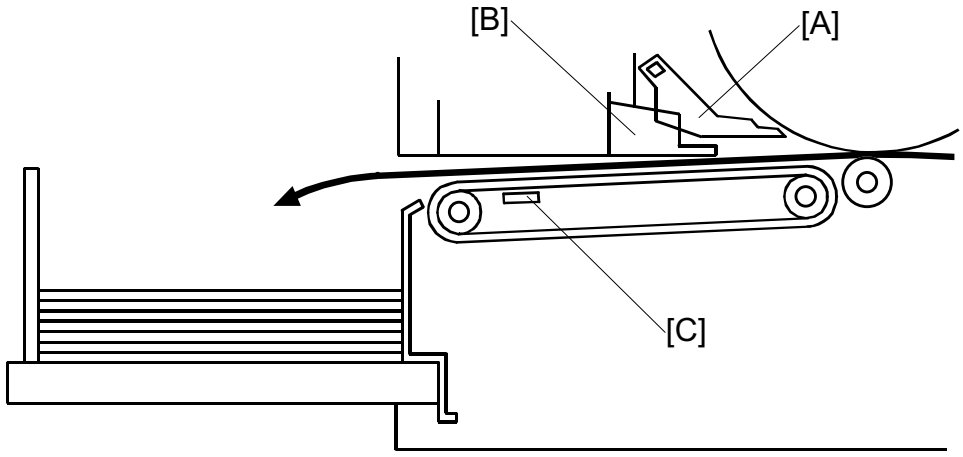
Side Fence Friction Pads

The two side fence friction pads are included as accessories. These are not used normally, but if paper multi-feed frequently occurs, the friction pads [A] can be installed to apply stopping pressure to the paper. These are especially useful when thin paper is used.

The user can install the friction pads if they are using thin paper.

2.7 PAPER DELIVERY

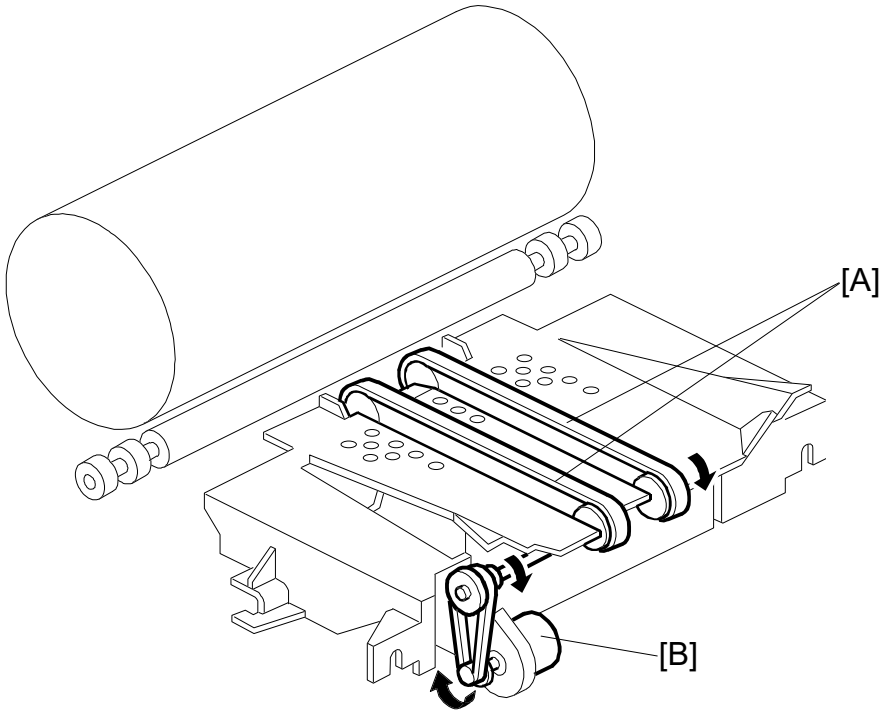
2.7.1 OVERALL



The exit pawl [A] and the air knife [B] separate the paper from the drum. The paper is transported to the delivery table by the delivery unit, which includes rubber belts and a vacuum fan motor.

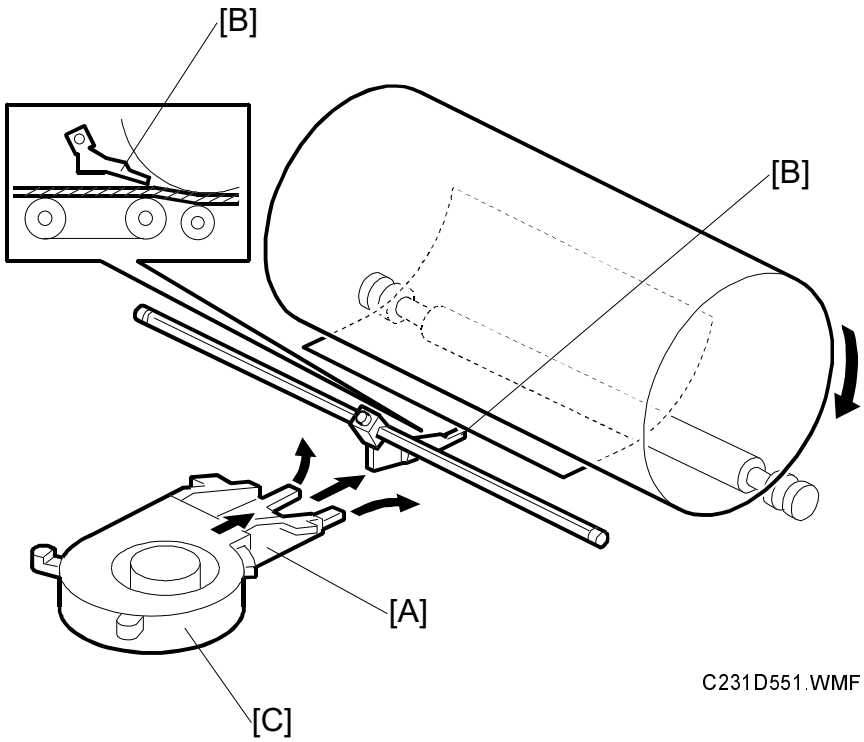
The paper exit sensor [C] (a reflective photosensor) detects paper jams.

2.7.2 PAPER DELIVERY UNIT DRIVE MECHANISM



The vacuum fan inside the unit holds the paper against the transport belts [A] to deliver the paper to the delivery table. The transport belts are driven by an independent dc motor (the paper delivery motor [B]).

2.7.3 PAPER SEPARATION FROM DRUM



The air from the air knife nozzle [A] separates the paper from the drum.

The exit pawl [B] prevents the paper from being transported upwards and being wrapped around the drum, even if the air does not separate the paper properly.

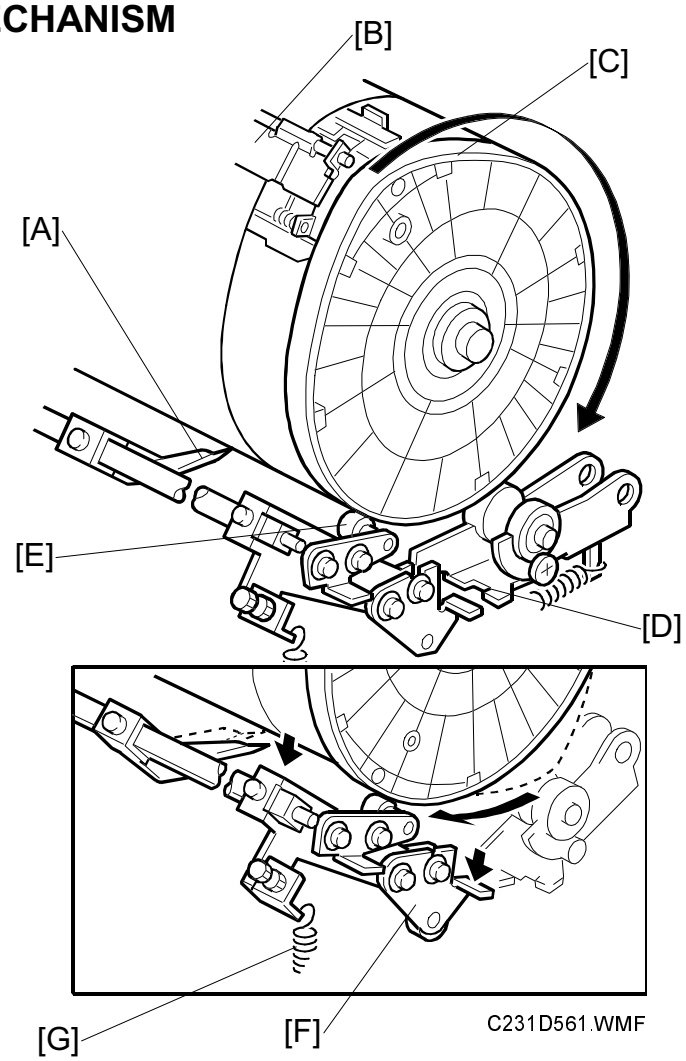
The air knife fan motor [C] starts blowing air when the print start key is pressed or master cutting is finished. The paper passes under the exit pawl and is delivered to the delivery table. The motor stops when the last sheet of paper is fed out.

2.7.4 EXIT PAWL DRIVE MECHANISM

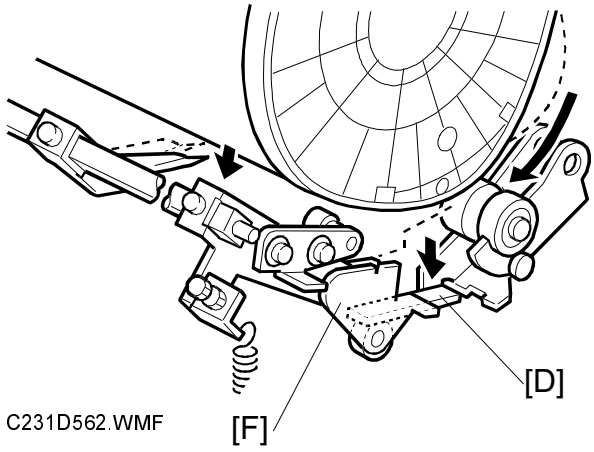
During printing, the distance between the exit pawl [A] and the drum is very small to prevent paper wrap jams. However, when the master clamper [B] approaches the exit pawl (as the drum turns), the pawl has to be moved away from the drum to prevent it from being damaged by the master clamper. This is controlled by the front drum flange [C], which is cam-shaped, and the cam follower [E] on the exit pawl shaft.

When the cam follower is not pushed out by the drum flange, the exit pawl closely approaches the drum surface, due to the tension of spring [G].

As the master clamper approaches the exit pawl, the high point of the drum flange cam [C] moves into contact with the cam follower [E] pushing it down. This moves the cam follower arm [F] downwards. The pawl shaft turns clockwise to move the pawl away from the drum.



When printing finishes and the printing pressure is released, the cam follower arm [F] is engaged by the printing pressure release arm [D] and held in the lower position. Therefore, after printing finishes, the cam follower is out of contact with the cam, and the exit pawl moves away from the drum to its normal position.



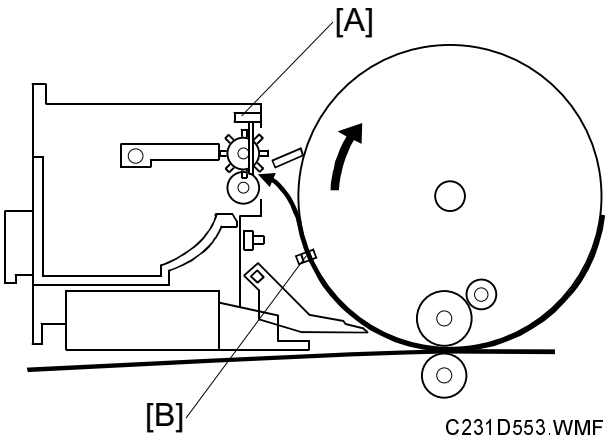
2.8 ERROR DETECTION

2.8.1 ORIGINAL JAM DETECTION

The jam indicator lights if one of the following conditions occur.

Jam Condition	Description
Non-feed	The scan line sensor does not switch on within 5 seconds of the ADF motor starting.
Misfeed 1	The scan line sensor does not turn off after turning on even when the trial print is made (when the printing pressure sensor is actuated).
Misfeed 2	When the final page of the document has been fed out of the scanner, or when a jammed document has been removed, the ADF motor reverses. The message is displayed if the document sensor stays on at this time.

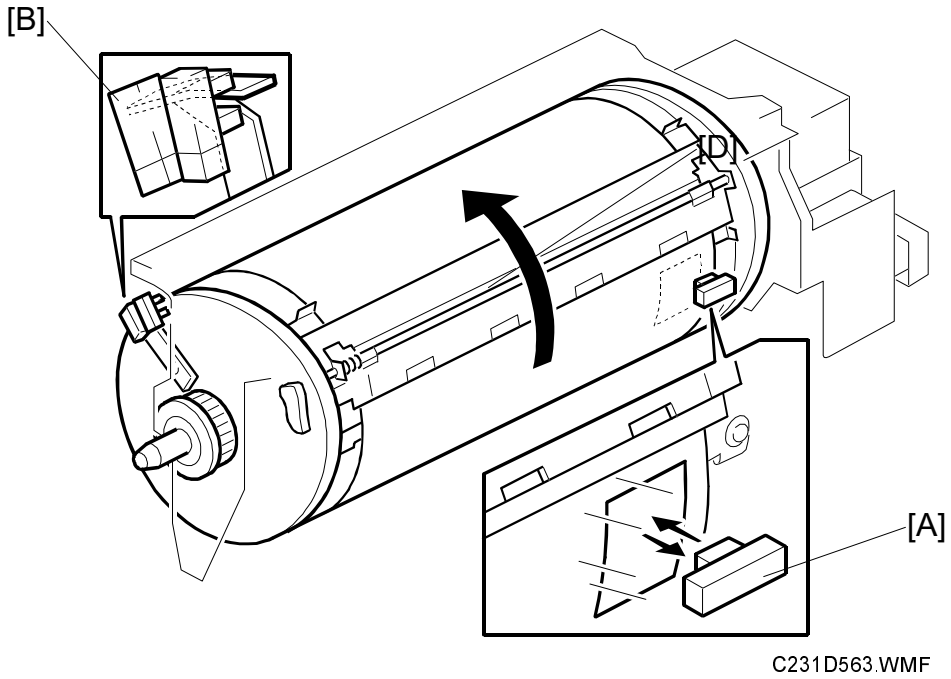
2.8.2 MASTER EJECT JAM DETECTION



The master eject jams are detected by the master eject sensor [A]. The jam indicator lights in the following conditions:

1) If the master eject sensor is actuated when the main switch is turned on.
2) If the master eject sensor is not actuated within 0.3 seconds after the drum started turning to feed the master into the master eject box.
3) If the master eject sensor is not actuated when the drum makes a half turn and passes the 2nd feed timing sensor [B]. This happens when the picked up master leading edge is pulled back to the drum and the master remains on the drum. (The jam indicator lights after the drum returns to the home position.)
4) If the master eject sensor is actuated when the pressure plate is returned to the home position. This happens when the master trailing edge sticks on the pressure plate and is pulled back to the master eject rollers.

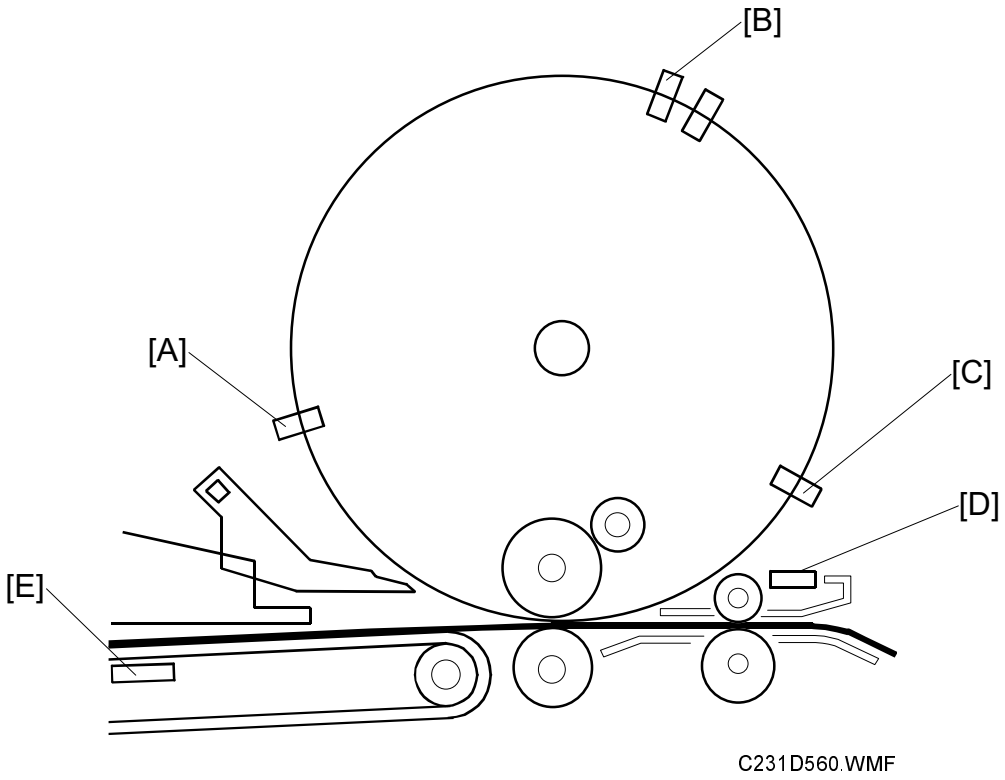
2.8.3 MASTER FEED JAM DETECTION



There is no jam sensor in the master feed path. Master feed jams are detected by the drum master sensor [A], which detects the presence of the master on the drum.

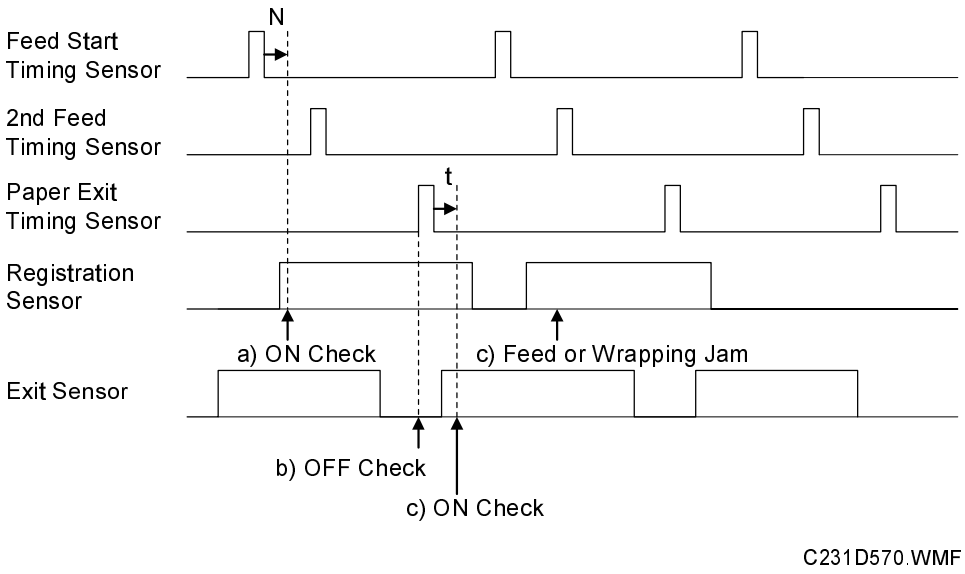
When the drum returned to the home position (i.e. the master eject position) after master making, if the drum master sensor [A] does not detect a master on the drum, the jam indicator on the operation panel will light. (The master eject position sensor [B] is used to check that the drum is at the home position.)

2.8.4 PAPER FEED JAM DETECTION



Paper jams are detected by the registration sensor [D] and the exit sensor [E]. Jam detection timing is determined by the drum position sensors and the main motor encoder. The 2nd feed timing sensor [A] and paper exit timing sensor [B] are used as the drum position sensors.

The timing chart on the next page shows the jam detection timing.



a) When the CPU counts a certain number of main motor encoder pulses (N) after the 2nd feed timing sensor [A] is actuated, if the registration sensor [D] does not detect the paper, the jam indicator lights.

b) When the exit timing sensor [B] is actuated, if the paper exit sensor [E] remains activated, the jam indicator lights.

c) When a certain time (t) (this time depends on the drum speed) has passed after the exit timing sensor [B] is actuated, if the paper exit sensor [E] is not activated, the machine detects a paper jam. If this jam condition is detected, the CPU stops the next paper from being fed. When the 2nd feed timing sensor [A] is actuated:

1. If the registration sensor [D] is activated, a registration failure is detected.
2. If the registration sensor [D] is not activated, a paper wrap jam is detected.

3. INSTALLATION

3.1 INSTALLATION REQUIREMENTS

Carefully select the installation location because environmental conditions greatly affect machine performance.

3.1.1 OPTIMUM ENVIRONMENTAL CONDITION

1. Temperature —10 to 30°C (50 to 86°F)
2. Humidity —20 to 90 % RH 20 to70 % RH (ADF)
3. Install the machine on a strong and level base. The machine must be level within 5 mm (0.2”) both front to rear and left to right.

3.1.2 ENVIRONMENTS TO AVOID

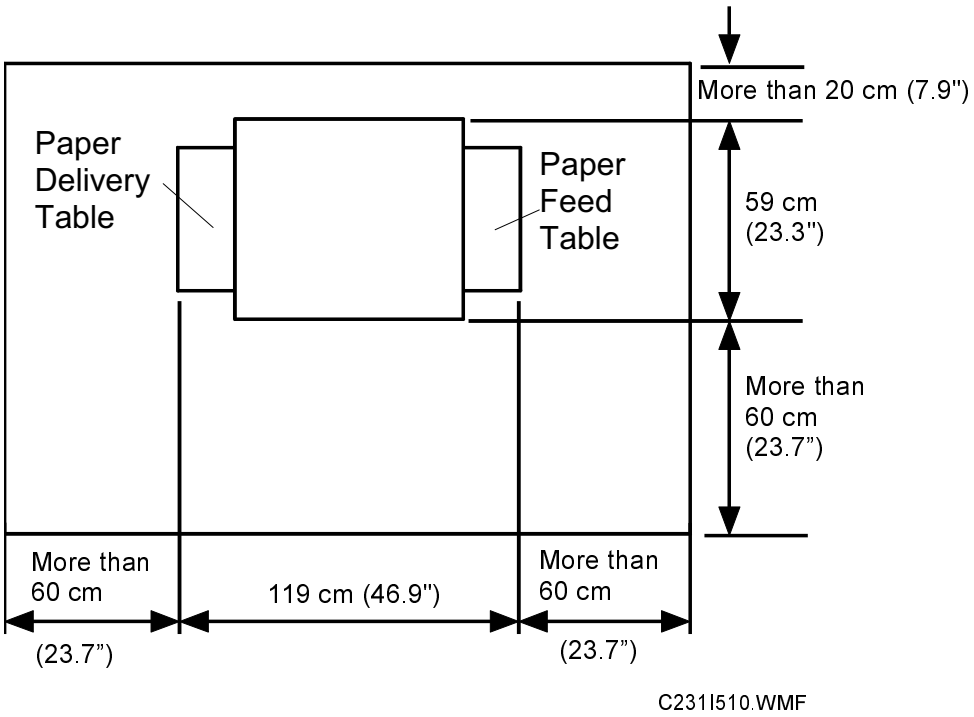
1. Locations exposed to direct sunlight or strong light (more than 1,500 lux).
2. Dusty areas.
3. Areas containing corrosive gases.
4. Locations directly exposed to cool air from an air conditioner or reflected heat from a space heater. (Sudden temperature changes from low to high or vice versa may cause condensation within the machine.)

3.1.3 POWER CONNECTION

1. Securely connect the power cord to a power source.
2. Make sure that the wall outlet is near the machine and easily accessible.
3. Make sure the plug is firmly inserted in the outlet.
4. Voltage must not fluctuate more than 10%.
5. Avoid multi-wiring.
6. Do not pinch the power cord.

3.1.4 ACCESS TO MACHINE:R

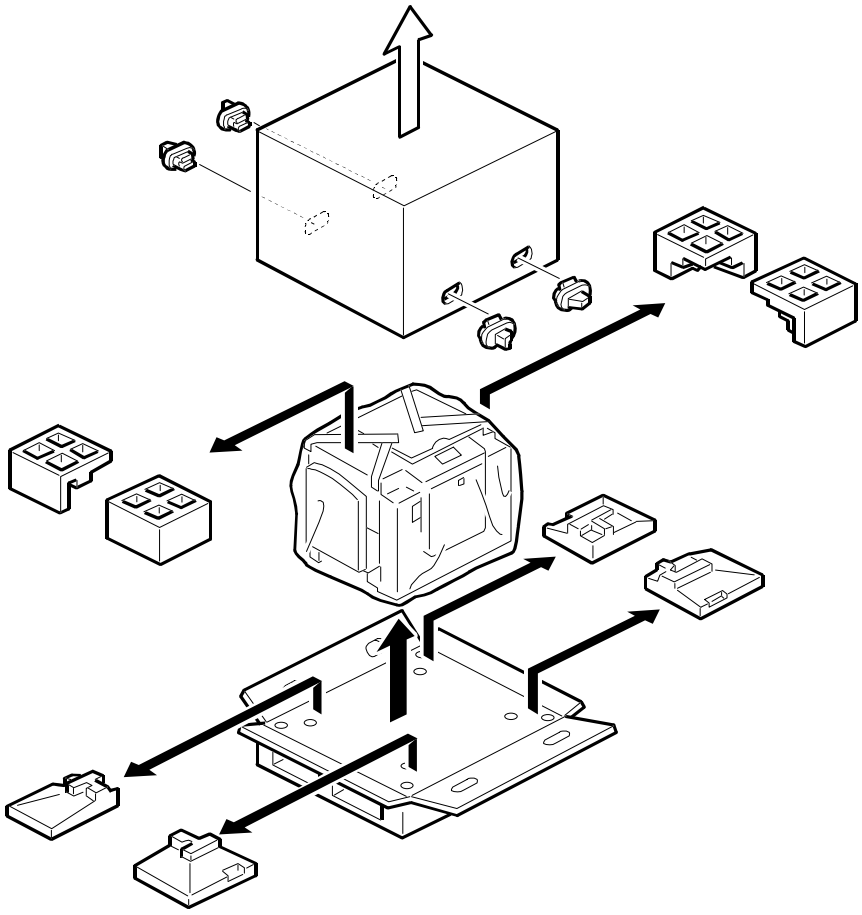
Place the machine near a power source, providing clearance as shown below.



3.2 INSTALLATION PROCEDURE

3.2.1 MAIN BODY

Accessory Check

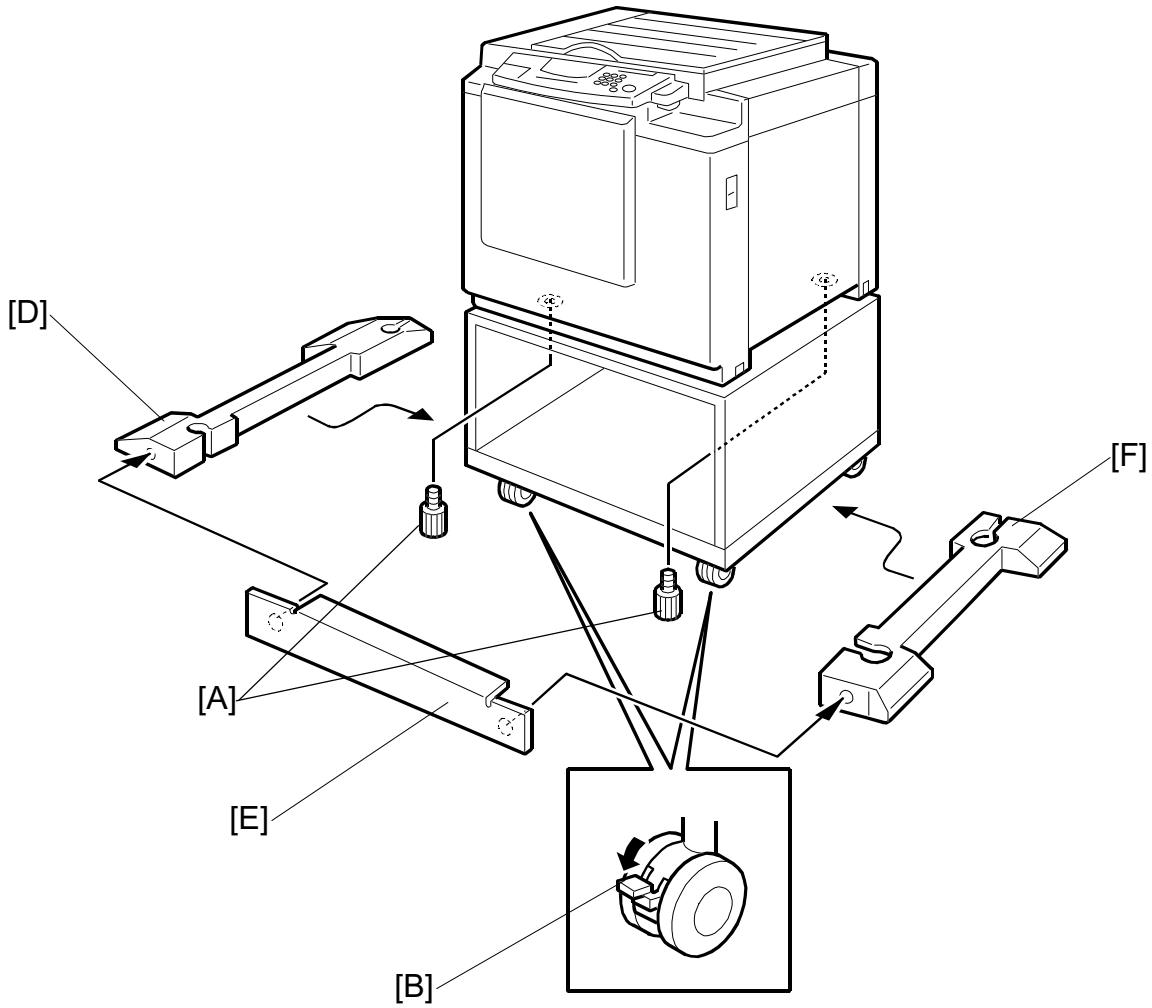


C231I522.WMF

Make sure that you have all the accessories listed below:

Master Spool..... 2
Paper Feed Side Pad 2
Operating Instructions (except the Ricoh European version).. 1
NECR (Ricoh version only)..... 1
Stabilizer brackets (3 brackets)..... 1 set
Model Name Plates (OEM version only)..... 1 set

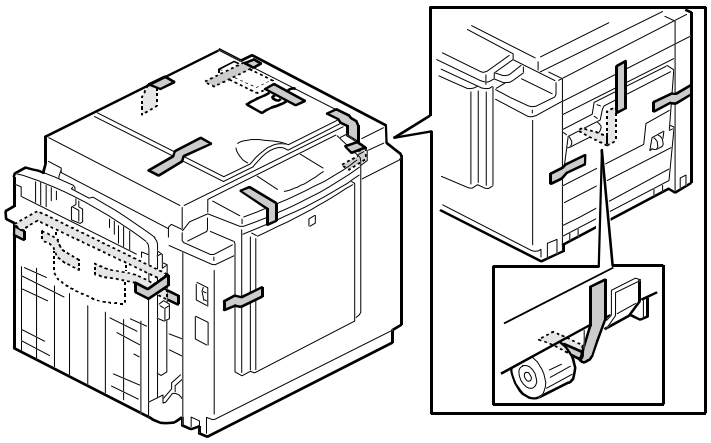
Installation Procedure



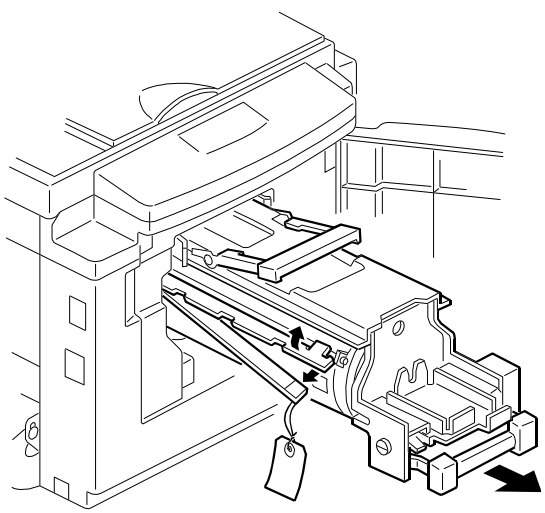
1. Unpack the box. When installing the optional table, mount the machine, as shown (There are 2 screws packed with the table).

⚠CAUTION

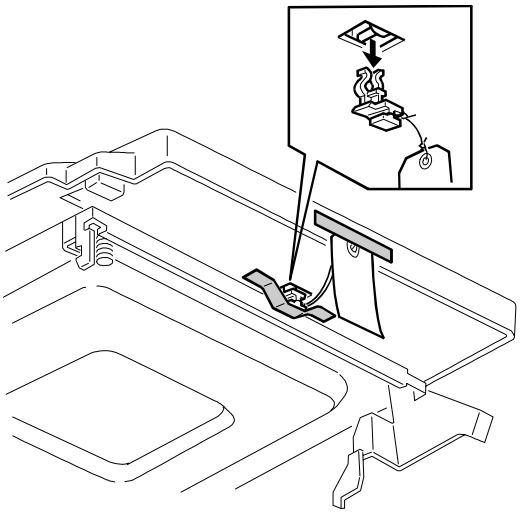
1) Unplug the power cord before starting the following procedure.
2) Only handle the carrying handles on the bottom corners of the machine.
3) Secure the machine on the table with the 2 screws [A] provided. This procedure prevents the machine from falling from the table when the scanner unit is open.
4) Lock the casters of the table as shown [B], to prevent the machine from moving (e.g. when the drum is set).
5) Set the stabilizer brackets [D], [E], and [F] under the optional table and connect 2 stabilizer brackets [D] and [F] by the stabilizer bracket [E].



C231I523.WMF

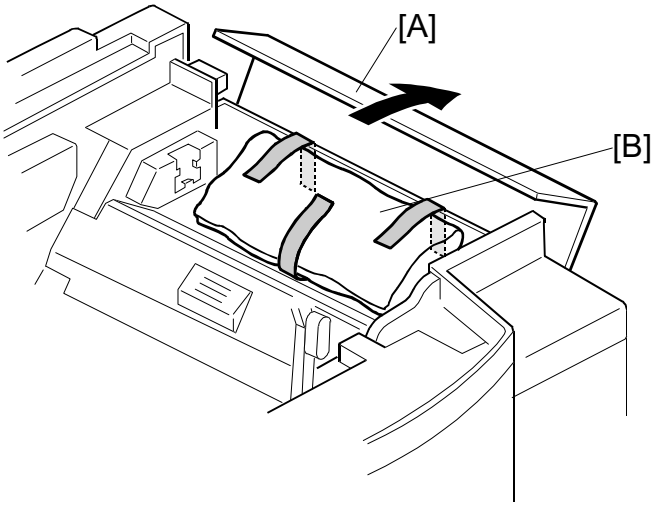


C231I531.WMF



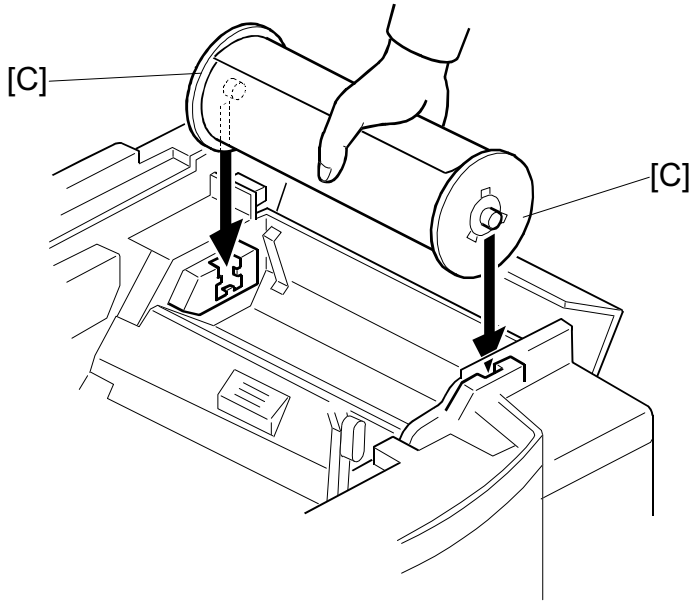
C231I532.WMF

2. Remove the tape and string securing the covers and units as shown above.
3. Open the paper delivery table.



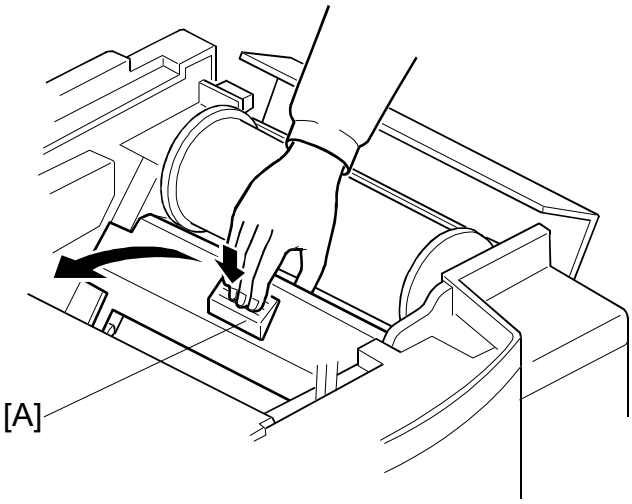
C231I526.WMF

4. Open the scanner unit, then the upper cover [A], and take out the accessory bag [B].



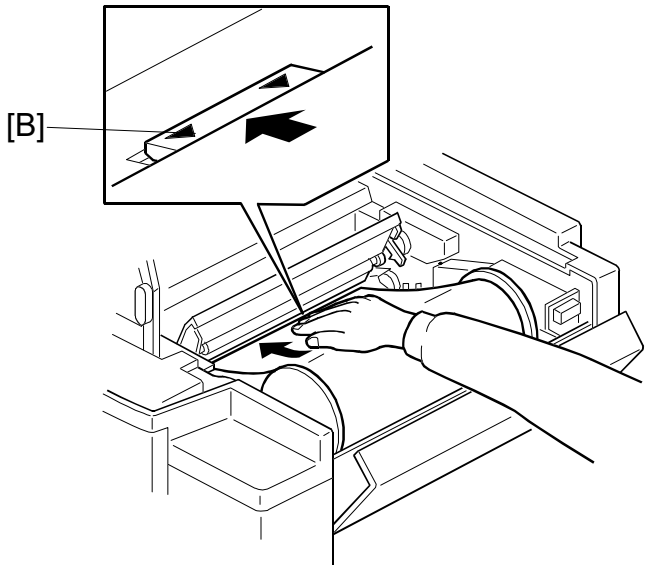
C231I527.WMF

5. Insert both spools [C] into the new master roll.
6. Set the master roll as shown.



C231I528.WMF

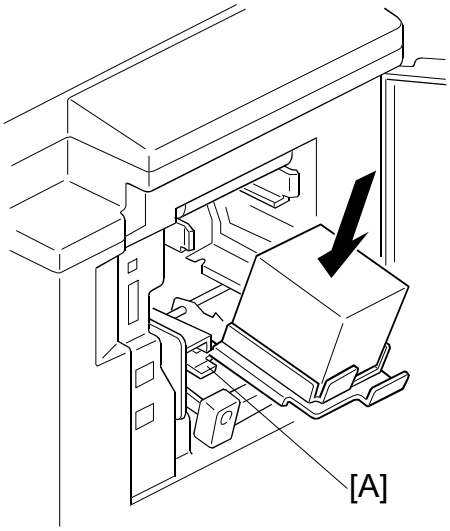
7. Open the platen roller unit by pushing the button [A].



C231I529.WMF

8. Insert the leading edge of the master roll under the platen roller. The arrows [B] indicate the correct position of the master leading edge.
9. Close the platen roller unit.
10. Close the upper cover and scanner unit.

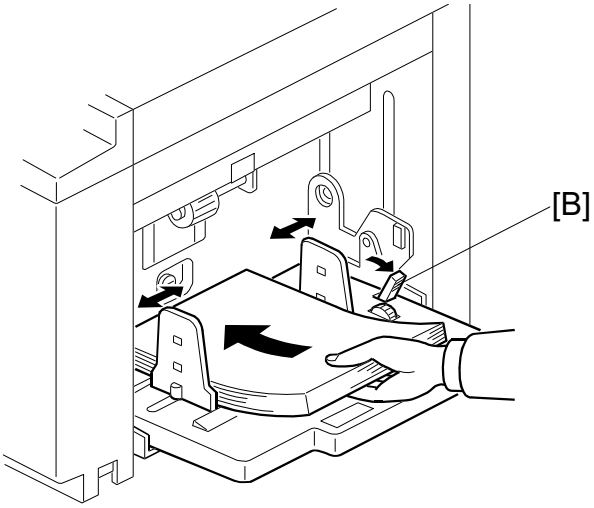
11. Push the ink cartridge release button [A] to slide out the ink cartridge holder.
12. Install the new ink cartridge.



C231I530.WMF

13. Release the side fence lock lever [B], then install the paper.
14. Adjust the side fence positions so that they touch the paper firmly. Engage the side fence lock lever [B].
15. Firmly insert the plug in the wall outlet.

CAUTION: Make sure that the wall outlet is near the machine and easily accessible.



C231I524.WMF

16. Turn on the main switch.
17. Press the “Economy Mode” key while holding down the “0” key, to supply ink in the drum.
18. Make test copies.

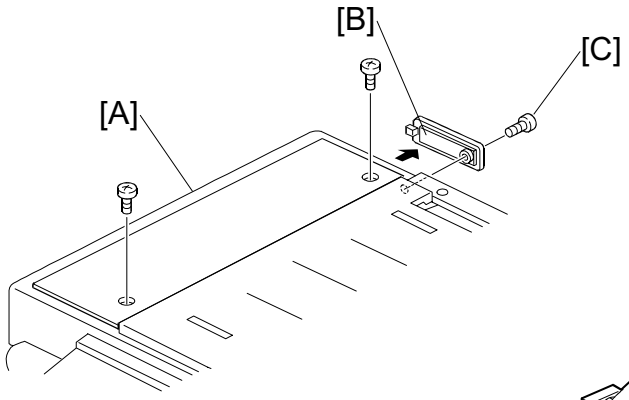
3.2.2 AUTO DOCUMENT FEEDER (OPTION)

Accessory Check

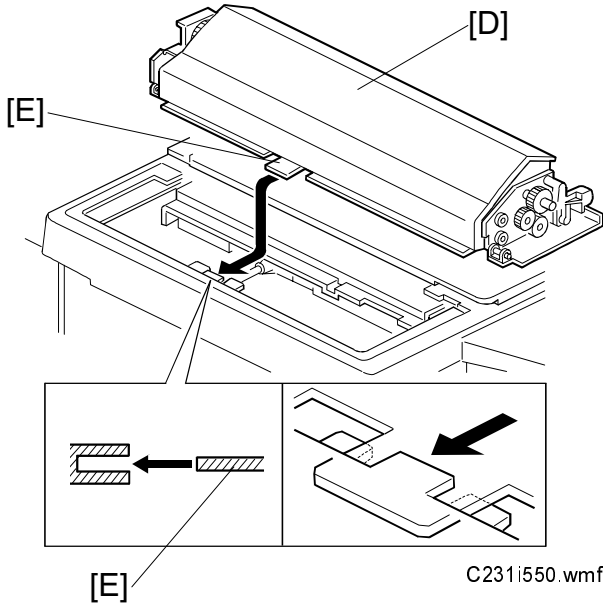
Make sure that you have all the accessories listed below:

ADF Unit	1
Upper Front Cover	1
Upper Rear Cover	1
Lower Front Cover	1
Lower Rear Cover	1
Connector Cover	1
ADF Roller Assembly	1
Original Table	1
Platen Cover Stopper	1
M3 x 8 Screws (to install the lower front/rear covers)	4
M3 x 6 Sunken Screws (to install the upper front/rear covers)	2

Installation Procedure



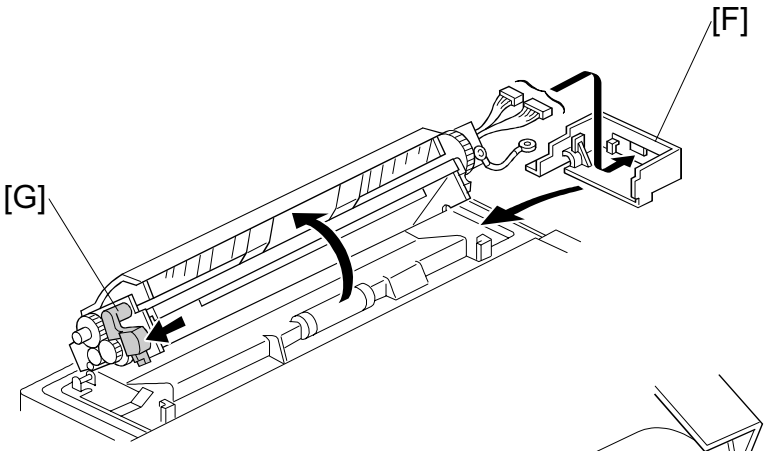
C231I511.WMF



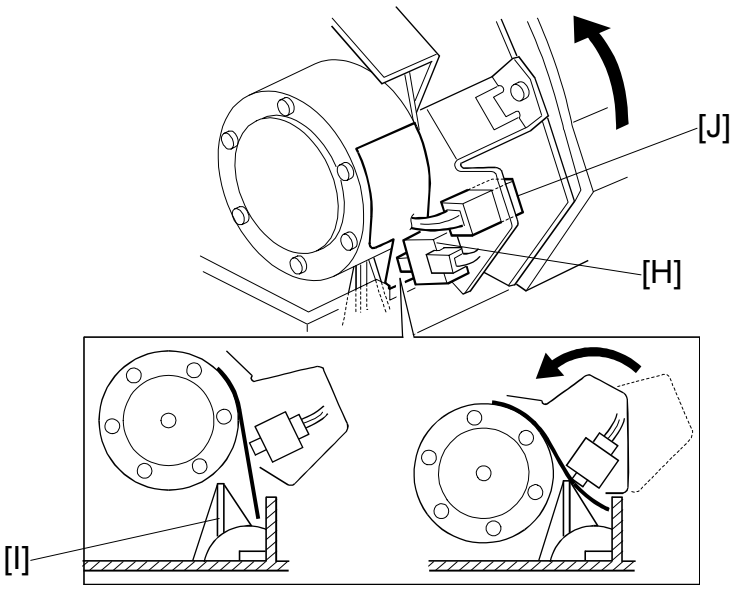
C231i550.wmf

1. Remove the cover [A] (2 screws).
2. Remove the small cover [B] (1 screw). Retain the screw [C] for step 9.
3. Mount the ADF unit [D].

NOTE: When you mount the ADF unit [D] on the scanner unit, make sure to insert the tab [E] as shown above.



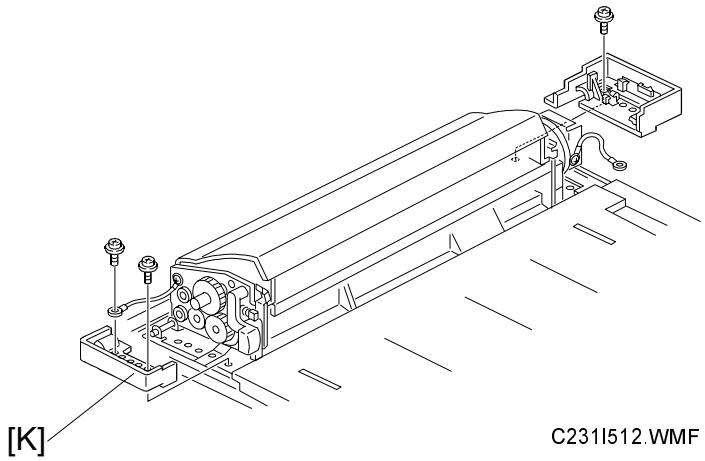
C231I552.WMF



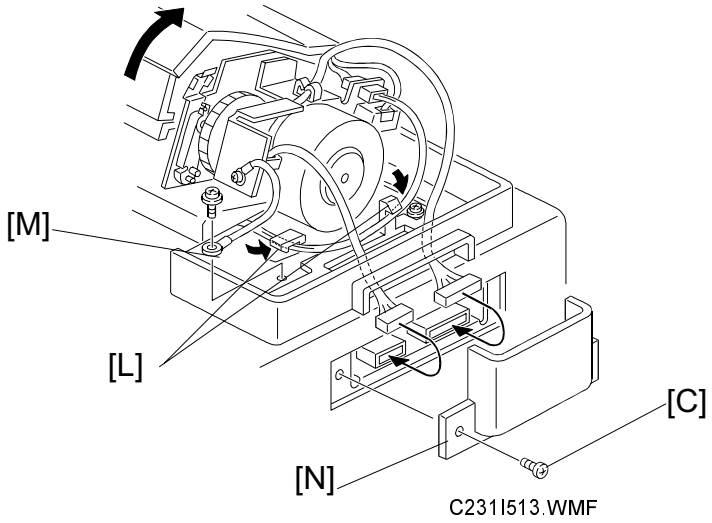
C231I553.WMF

4. Secure the non-operation side of the ADF unit with the ADF lower rear cover [F] (1 screw).

NOTE: 1) When you install the ADF lower rear cover [F], at first you must open the ADF unit (flip it up) by pressing the release lever [G] as shown above.
2) There is a switch [H] to detect whether the ADF unit is closed. Make sure that the switch is properly activated when the ADF unit is closed after installing the ADF lower rear cover [F]. Since the rib [I] on the ADF lower rear cover [F] would interfere with the switch [H] if you install the ADF lower rear cover [F] with the ADF unit [D] closed, you must reinstall from step 3.
3) The connector [J] is not used and remains open.

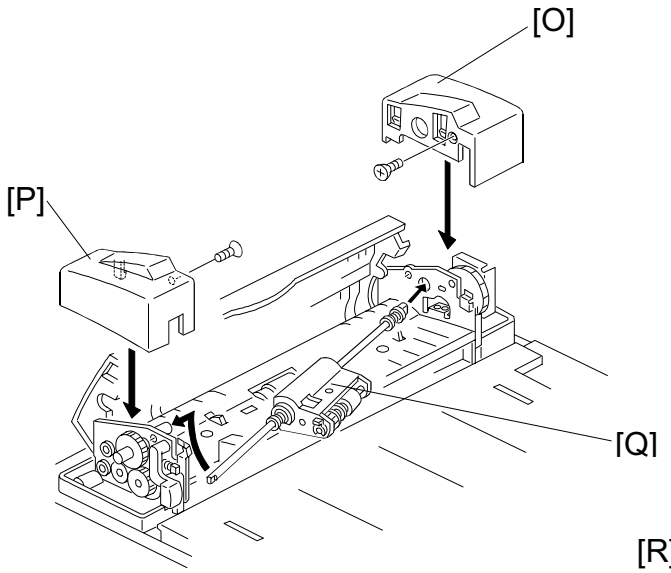


C231I512.WMF

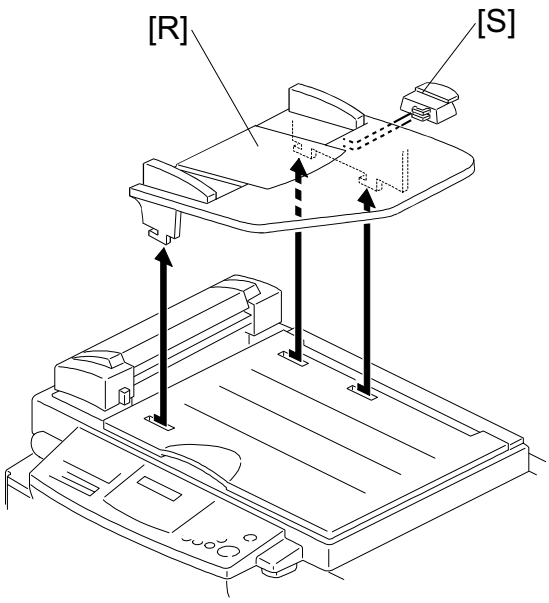


C231I513.WMF

5. Secure the operation side of the ADF unit with the ADF lower front cover [K] (2 screws). Secure the grounding wire with one of the two screws.
6. Secure the harness with the two clamps [L].
7. Secure the grounding wire [M] (1 screw).
8. Pass the two harnesses through the cutout in the ADF lower rear cover, and then connect the harnesses to the main body.
9. Attach the connector cover [N] with the screw [C] removed in step 2.



C231I514.WMF



C231I515.WMF

10. Attach the ADF upper rear cover [O] (1 sunken screw and 1 hook).
11. Attach the ADF upper front cover [P] (1 sunken screw and 2 hooks).
12. Install the ADF roller assembly [Q].
13. Attach the original table [R], then the platen cover stopper [S].

NOTE: To enable the use of the ADF, access SP mode and set SP No. 2 to "1".

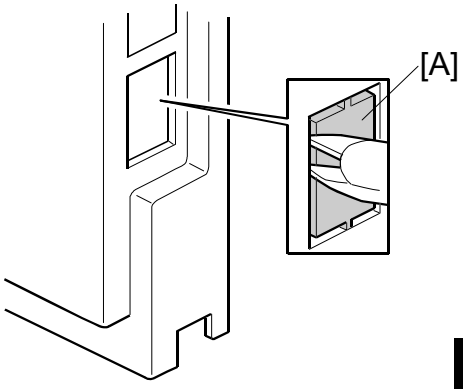
3.2.3 TAPE MARKER (OPTION)

Accessory Check

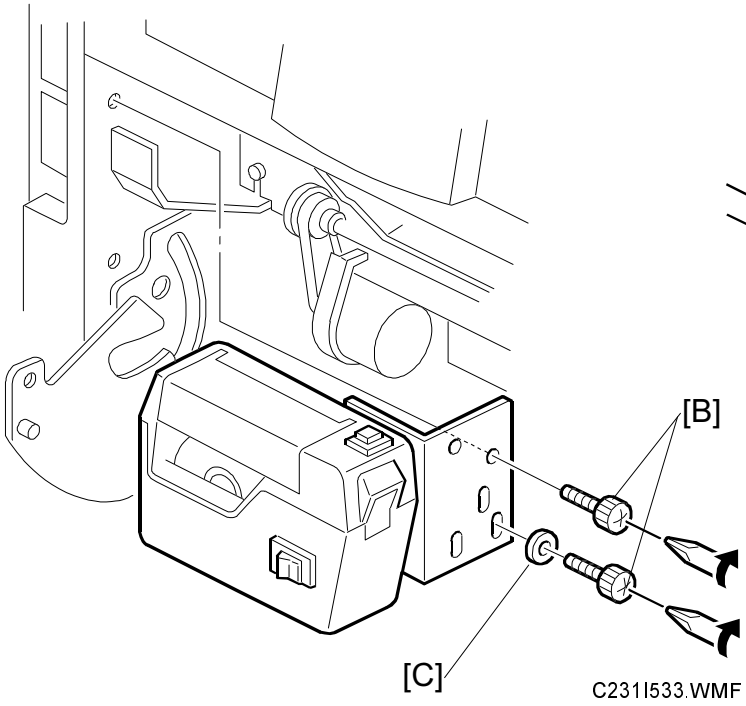
Check the quantity and condition of the accessories in the box against the following list:

1. Knob Screw (For models #C210, C217, C218, C219, C222, C223, C225, C228 and C231 only)..... 2
2. Screw M4 x 25 (For models # C211, C212, C213, C214, C216, C224, and C226 only) 2
3. Hexagon Nut M4 (For models # C211, C212, C213, C214, C216, C224, and C226 only) 2
4. Auxiliary Bracket (For model # C226 only)..... 1
5. Screw M4 x 8 (For model # C226 only)..... 2
6. Lock Washer (For model # C226 only) 1
7. Lock Washer..... 1
8. Tape 1

Installation Procedure
- For C231 -



C231I536.WMF

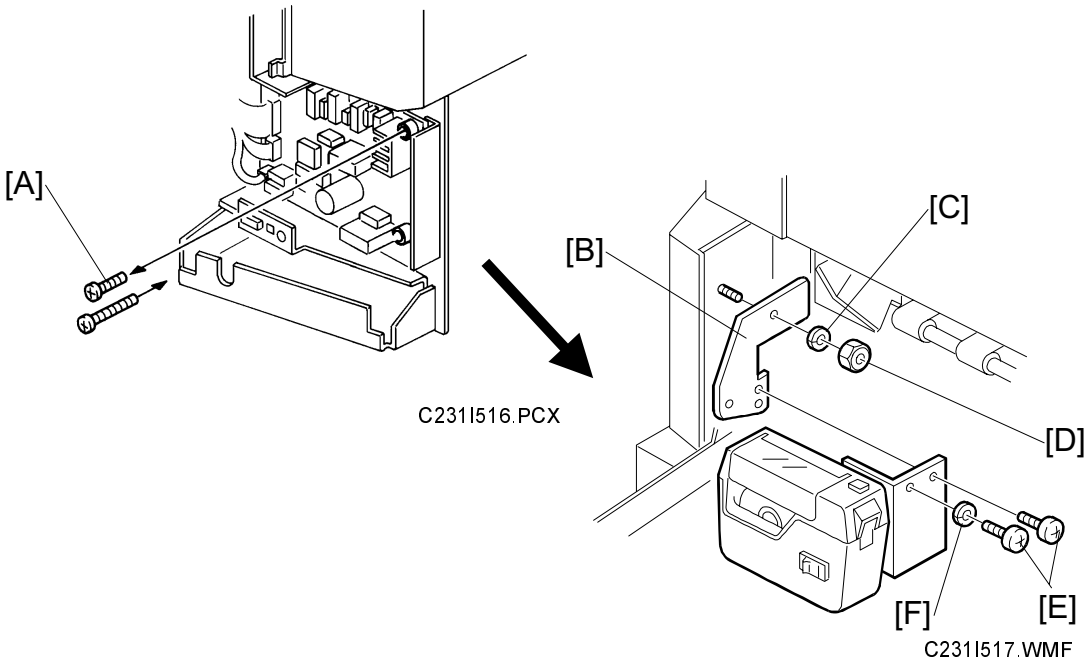


C231I533.WMF

1. Turn off the main switch and unplug the power cord.
2. Remove the paper delivery table (2 screws).
3. Remove the paper delivery plate (4 screws).
4. Cut the cap [A] off the rear cover with pliers.
5. Remove the small cap in the rear cover of the main body. Then, connect the tape marker harness to the main body, and install the connector cover using one of the rear cover securing screws.
6. Install the tape marker on the main body with two knob screws [B] (accessories) in the two outside holes of the tape marker bracket.
7. Reinstall the paper delivery plate and paper delivery table.
8. Refer to "Common Steps".

NOTE: 4) Tighten the knob screws with a screwdriver to prevent them from coming loose.
5) Install the lock washer [C] (accessory) with the lower of the two knob screws.

- For C226 -



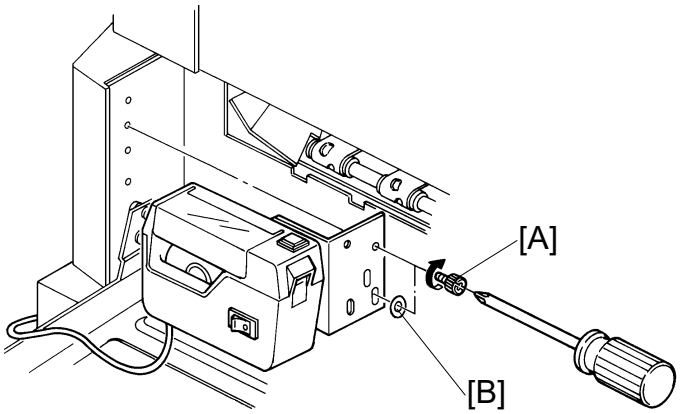
Main Body:

1. Turn off the main switch and unplug the power cord.
2. Remove the rear cover (6 screws).
3. Replace the screw [A], to secure the AC drive board with M4 x 25 screws (accessory).
4. Reinstall the rear cover.
5. Install the auxiliary bracket [B] on the main body with the hexagon nut [D] (accessory) as shown.
   Install the lock washer [C] (accessory) with the nut.

Tape Marker:

6. Install the tape marker on the auxiliary bracket with two M4 x 8 screws [E] (accessories).
7. Install the lock washer [F] (accessory) with one of the two screws.
8. Refer to "Common Steps".

- For C210, C218, C219, C222, and C223 -



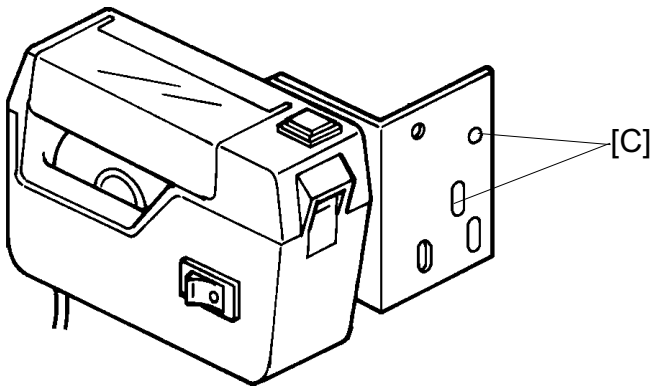
C532I502.PCX

1. Turn off the main switch and unplug the power cord.
2. Install the tape marker on the main body with two knob screws [A] (accessory) in the two outside holes of the tape marker bracket.
3. Refer to "Common Steps".

NOTE: 1) Tighten the knob screws with a screwdriver to prevent them from coming loose.
2) Install the lock washer [B] (accessory) with the lower of the two knob screws.

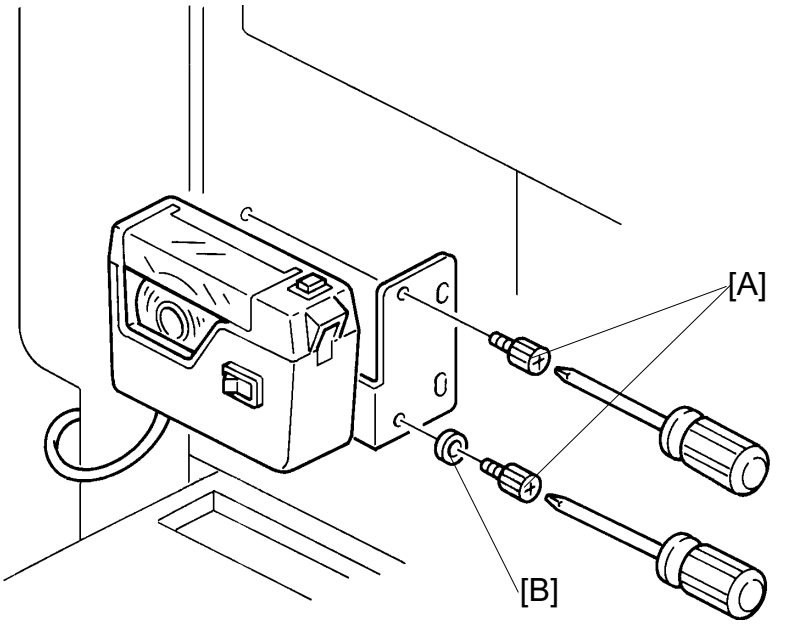
— For Model C228 and the models on which the New Paper Delivery Table is installed —

Use the two holes of the tape marker bracket [C] as shown below.



C532I504.PCX

- For C217 and C225 -

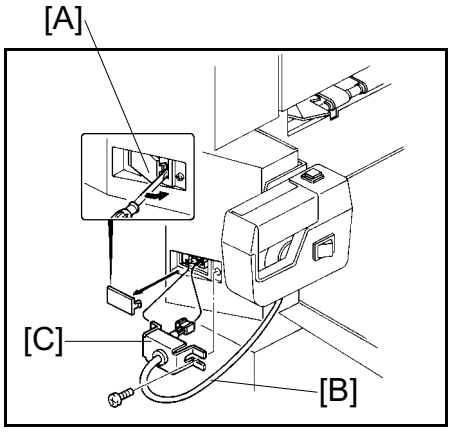


1. Turn off the main switch and unplug the power cord.
2. Install the tape marker on the main body with two knob screws [A] (accessory) in the two inside holes of the tape marker bracket.
3. Refer to “Common Steps”.

NOTE: 1) Tighten the knob screws with a screwdriver to prevent them from coming loose.
2) Install the lock washer [B] (accessory) with the lower of the two knob screws.

- Common Steps -

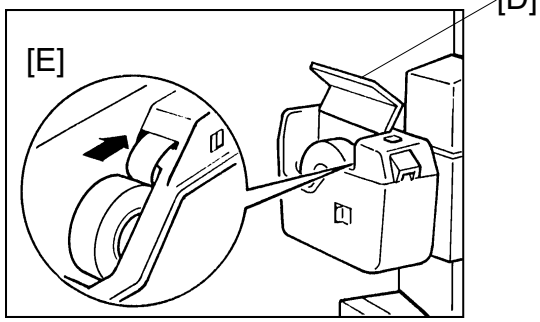
1. Remove the small cap in the rear cover of the main body [A]. Then, connect the tape marker harness [B] to the main body, and install the connector cover [C] using one of the rear cover securing screws.



C231I518.PCX

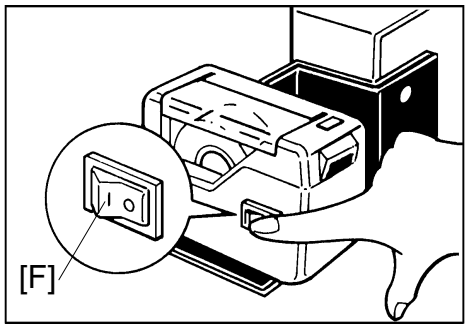
2. Open the tape marker cover [D]. Then, insert the leading edge of the tape into the tape entrance until it stops as shown in the illustration [E].

   NOTE: Be sure that the tape is installed in the proper direction. If it is not, the tape marker will not work correctly.



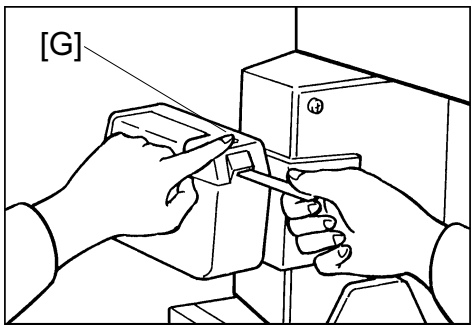
C231I519.PCX

3. Turn on the main switch of the main body and set the SP mode to activate the tape marker. (Refer to the service program table in "4. SERVICE TABLES.")
4. Turn on the tape marker switch [F].



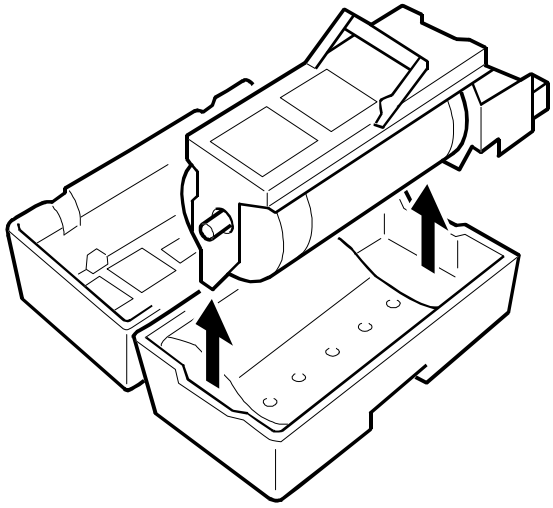
C231I520.PCX

5. Press the tape cut button [G] to cut off the leading edge of the tape.
6. Check the tape marker operation using the Memory/Class modes of the main body.

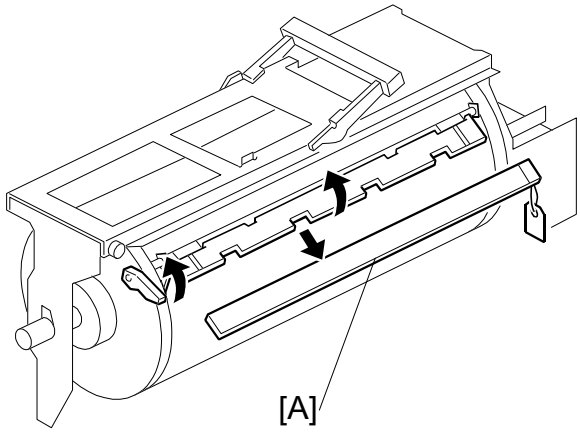


C231I521.PCX

3.2.4 COLOR DRUM (OPTION)



C231I534.WMF



C231I537.WMF

There are three types of color drum units:

- B4 Size: For the C231 B4 model
- Legal Size: For the C231 Legal model
- A4 Size: For the C231 A4 model

1. Remove the protective sheet [A] from the drum unit.
2. Remove the tape securing the ink holder.
3. Attach a color indicator decal to the drum case. The decal must be the same color as the ink in use.
4. Remove the drum unit.
   a) Leave the master wrapped around the removed drum to protect the drum from dust and drying.
   b) Keep the removed drum unit in the drum case.
5. Install the color drum unit.

   The color drum indicator on the operation panel stays lit when a color drum is mounted in the machine.
6. Install the colored ink.
   a) Remove the ink cartridge cap.
   b) Insert the ink cartridge into the ink holder.

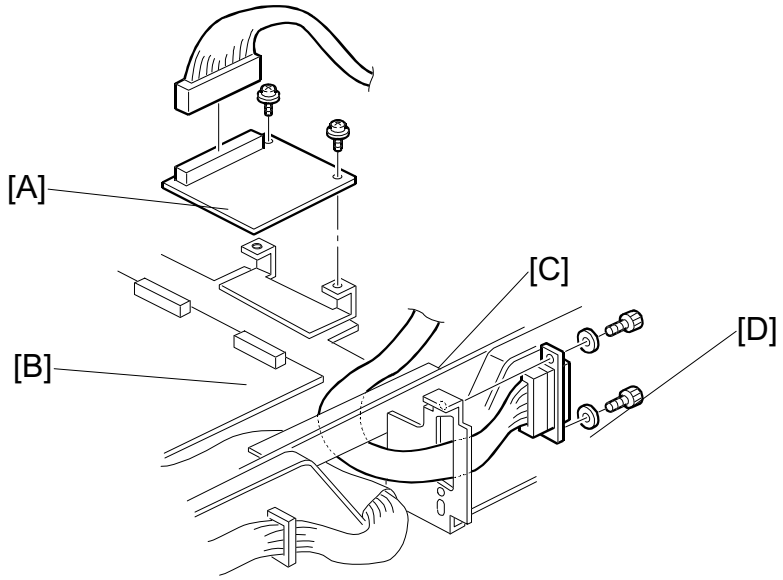
3.2.5 INTERFACE BOARD (OPTION)

Accessory Check

Check the quantity and condition of the accessories in the box against the following list:

1. Interface Board 1
2. Interface Harness 1
3. Screw M3 x 6 2
4. Lock Screws 2
5. Washer 2

Installation Procedure



C532I533.PCX

1. Turn off the main switch and unplug the power cord.
2. Remove the upper rear cover.
3. Remove the MPU cover.
4. Connect CN102 of the interface board [A] to CN110 [B] of the MPU board and secure it using two screws.
5. Connect the harness [C] to CN101 of the interface board, and secure it to the connector bracket [D] using two lock screws and washers.
6. Remove the communications port cover plate from the upper rear cover.
7. Reinstall the MPU cover.
8. Reinstall the upper rear cover.

4. SERVICE TABLES

4.1 SERVICE REMARKS

4.1.1 MASTER FEED SECTION

1. Thermal Head 1

When installing the thermal head, there are important remarks. See “6.5.2 Thermal Head Removal.” Also, see "Remarks for Handling the Thermal Head" in "2.2.7 Thermal Head.".

2. Thermal Head 2

When replacing the thermal head, be sure to adjust the voltage supplied to the thermal head (See “6.5.3 Thermal Head Voltage Adjustment”).

4.1.2 PAPER FEED SECTION

1. Friction Pad

When removing and reinstalling the friction pad base, be sure to install it in the correct orientation and position. (See "6.7.1 Paper Feed Roller, Pick-up Roller, and Friction Pad")

2. Paper Feed Roller and Paper Separation Roller 1

Be careful to install the rollers the correct way around. They have a one-way clutch inside.

3. Paper Feed Roller and Paper Separation Roller 2

Do not touch the surface of the roller with bare hands.

4. Paper Guide Plate Position for Registration Roller

Be sure to adjust the paper guide plate position once it is removed. See "6.7.4 Registration Roller Clearance Adjustment."

4.1.3 DRUM AND DRUM DRIVE SECTION

1. Main Motor

When the motor pulley has been removed from the motor and then reinstalled, be careful of the position of the pulley on the motor shaft. (See "6.9.8 Main Motor Pulley Position Adjustment")

2. Doctor Roller

Normally the doctor roller gap is not adjusted or changed. It tends to be difficult to adjust in the field. If the gap becomes narrower, an uneven image may appear on the prints. If it becomes wider, too much ink will be applied to the drum screens, resulting in ink leakage from the drum.

3. Drum Master Clamper

1) When installing the drum master clamper, be sure to position the two springs in the drum master clamper correctly.
2) Do not allow the inside of the clamping plate to become dirty with ink.
3) Do not use alcohol or other solvents to clean the inside of the clamping plate. Use a cloth dampened with water.

4. Ink Roller Unit

Do not disassemble the ink roller unit. Each part between the front and rear side plates of this unit has been precisely adjusted on the production line to keep the doctor and ink rollers parallel against the drum shaft.

5. Ink Pump 1

When the ink pump has been removed and reinstalled, be sure to adjust the plunger position. (See "6.9.6 Ink Pump Removal and Plunger Position Adjustment")

6. Ink Pump 2

When removing the ink pump, do not lose the small metal valve. When reinstalling the pump, first set the valve on the joint side as shown, then install the ink pump on the two joints. (See "6.9.6 Ink Pump Removal and Plunger Position Adjustment")

4.1.4 PAPER DELIVERY SECTION

1. Exit Pawl

The exit pawl clearance adjustment must be done prior to the drive timing adjustment. Once this has been done then the drive timing adjustment must be performed (See “6.10.4 Exit Pawl Clearance Adjustment” and “6.10.5 Exit Pawl Drive Timing Adjustment”).

4.1.5 ELECTRICAL COMPONENTS

1. Main Processing Unit (MPU) 1

After replacing the MPU, be sure to perform the following:

1) Vertical magnification adjustment (SP30, 36)
2) Side-to-side registration (SP31, 37)
3) Leading edge margin adjustment (SP33)
4) Leading edge registration adjustment (SP26, 38)
5) Correct drum type select (SP15)

If you use the backup RAM on the old MPU for new one, all data, including data in the SP mode, will be restored. You do not have to do the above procedures.

See "6.3 MPU Replacement."

2. Main Processing Unit (MPU) 2

After replacing the MPU, also do the following:

1) Ink detection adjustment
2) Master end sensor adjustment

See "6.3 MPU Replacement."

3. Power Supply Unit

When replacing the power supply unit, be sure to adjust the voltage supplied to the thermal head (See “6.5.3 Thermal Head Voltage Adjustment”).

4. Sensor Adjustments

Adjustment is needed for the master end sensor. For details, see 6.5.4 Master End Sensor Adjustment.

4.2 DIP SW, LED, VR, TP, AND FUSE TABLES

4.2.1 TEST POINTS

MPU

No	Usage
TP101	CIS Sample Clock
TP102	Video Signal
TP103	GND-a
TP104	Scan Line Synchronizing Signal
TP105	Ink Detection Pulse (Standard Pulse)
TP106	Ink Detection Pulse
TP107	Not used
TP108	Master End Sensor Output Voltage
TP109	GND-a
TP110	-12V

4.2.2 POTENTIOMETERS

MPU

No	Usage
VR101	Ink Detection Adjustment
VR103	Master End Sensor Adjustment

Power Supply Unit

No	Usage
VR2	Thermal Head Voltage Adjustment

4.2.3 LED'S

MPU

LED #	OFF	ON
101	Low Ink Condition	Sufficient Ink Condition

4.2.4 FUSES

MPU

FUSE #	Rated Current	Voltage	Related Devices
101	1 A	24VDC	Paper Transport Motor
102	1 A	24VDC	Ink Pump Motor, Master Eject Motor

PSU

FUSE #	Rated Current	Voltage	Related Devices
501	10 A	120/230VAC	AC Line
502	5 A	24VDC	Paper Transport Motor, Paper Feed Clutch, Air Knife Fan Motor, Front/Rear Pressure Release Solenoid, Vacuum Fan Motor
503	5 A	24VDC	Ink Pump Motor, Master Eject Motor, Optional Key Counter, Master Counter, Paper Counter, Contact Image Sensor
504	6.3 A	24VDC	Main Motor Control Board
505	5 A	24VDC	Optional Tape Dispenser

4.3 SERVICE CALL CODES

No.	Description/Definition	Points to Check
E-00	*Clamper Motor Failure* The MPU cannot detect the master clamper position sensor signal (open or closed) within 1.2 seconds after the clamper motor turns on.	* Mechanical interference with the clamper drive * Master clamper sensors * Clamper motor * Clamper drive mechanism
E-01	*Cutter Failure* • The cutter HP sensor does not turn on within 3 seconds after the cutter motor turns on. • If the master is not cut at the end of the master making. The drum master detection sensor is used to check if the black cover at the trailing part of the drum cloth screen is covered by the master just before the drum returns the home position. In this case, the SC is cleared once the power is off.	* Master cut error occurred * Cutter switch * Cutter motor * Cutter drive mechanism
E-02	*Paper Table Drive Failure* The paper height sensor or the table lower limit sensor does not turn on within 7 seconds after the table drive motor turns on.	* Paper table drive motor * Paper height sensor or table lower limit sensor * Mechanical interference with the paper table drive
E-04	*Thermal Head Overheat* Temperature of the thermal head is greater than 54°C when the Start key is pressed.	* Thermal head * Thermistor of the thermal head (short circuit) * Wait for the thermal head to cool down
E-06	*Main Motor Lock* The CPU cannot detect the feed start timing sensor signal within 2 seconds after the main motor turns on, or the sensor remains on for more than 0.5 seconds.	* Main motor * Power to the main motor * Feed start timing sensor * Mechanical interference with the drum drive
E-09	*Thermal Head Thermistor Open* The thermistor output voltage (CN109-A1) is over 4.9 volts.	* Thermal head thermistor * Thermal head connector
E-10	*Thermal Head Drive Failure* The CPU detects an abnormal condition in the thermal head drive circuit.	* Thermal head * MPU * Thermal head connector and harness
E-12	*Pressure Plate Motor Failure* The pressure plate home position sensor signal is not detected within 4 seconds after the pressure plate motor turns on.	* Mechanical interference with the pressure plate drive * Pressure plate motor * Pressure plate HP sensor

No.	Description/Definition	Points to Check
E-13	*Scanner Malfunction* • The scanner HP sensor does not turn on after the scanner motor moves for more than 7 seconds back to the home position after scanning. • The scanner cannot leave the home position within 4 seconds of power on. • When the scanner cannot return to the home position within 2 seconds of leaving.	* Mechanical interference with the scanner * Defective scanner HP sensor
E-14	*IPU error* Signal transmission error (from the IPU) occurred in the MPU.	* MPU

4.4 SERVICE PROGRAM MODE

The service program (SP) mode is used to check electrical data, change modes, or change adjustment values.

4.4.1 ACCESS PROCEDURE

Service Program Mode Access Procedure (For Engineers)

All service program modes can be accessed with the following procedures.

1. Press the following keys on the operation panel in the following order:

   - Method 1 -

   Clear Modes ⇒ **1** ⇒ **0** ⇒ **7** ⇒ **Clear/Stop**

   *: Hold down the Clear/Stop key for more than 3 seconds.

   - Method 2 -

   Clear Modes ⇒ **Clear/Stop** ⇒ **Economy** ⇒ **Enter (#)**

   *: For the China machine, use the Combine 2 Original key, instead of the Economy key.

   - Method 3 -

   Turn on the main switch while holding the **Start, Clear/Stop, and Enter (#)** keys simultaneously.

   NOTE: Method 3 is a special way to enter SP mode that differs from the other two methods. For example, when a service call indicator (E-xx) is displayed at power on, SP mode can only be accessed by Method 3.

   After you enter SP mode with Method 3, you can leave it by turning the main switch off then on again.

2. The following is displayed on the LCD when the SP mode is accessed.

   ```
   SP-MODE
   PROGRAM No. 0
   ```

3. Using the **number keys**, enter the desired SP mode number (listed in the service program table), then press the **Enter (#) key**.

   NOTE: The SP mode number can be shifted up or down by pressing the **Select Size And Direction ("∧" or "∨") keys.**

4. Follow the "Change Adjustment Values or Modes" procedure on the next page.

   NOTE: To cancel SP mode, press the **Clear Modes key**. To shift to another SP mode number, press the Enter (#) key again to return to the display in step 2. Enter the desired SP mode number.

   After you enter SP mode with Method 3, you can leave it by turning the main switch off then on again.

Service Program Mode Access Procedure (For Users)

This procedure allows users to access only the service program modes that are marked with an asterisk in the service program table.

1. Press the following keys on the operation panel in the following order:

   - Method 1 -

   Clear Modes ⇒ Clear/Stop

   *: Hold down the Clear/Stop key for more than 3 seconds.

   - Method 2 -

   Clear Modes ⇒ Clear/Stop ⇒ Enter (#)

2. The following is displayed on the LCD.

SP-MODE PROGRAM No. 0

3. Using the **number keys**, enter the desired SP mode number (listed in the service program table), then press the **Enter (#) key**.
4. Do the following procedure (‘Change Adjustment Values or Modes’). To cancel the SP mode, press the **Clear Modes key**.

Change Adjustment Values or Modes

1. After entering the desired SP mode number and pressing the **Enter (#)key**, the current value or mode will be displayed on the LCD (at the end of the second line).
2. Enter the desired value or mode using the **number keys** (listed in the service program table).

   NOTE: Use the **Memory/ Class key** to toggle between + and -.
3. Press the **Enter (#) key** to store the desired value or mode.
4. To cancel the SP mode, press the **Clear Modes key**.

4.4.2 SERVICE PROGRAM TABLE

*: Accessible by a customer

No.	Display	Function	Settings	Factory Setting	Comments
1	This SP number was used to enable the On-line key for some other models. On this model, the On-line key is enabled automatically when the optional PC controller is connected, and SP number 1 is not used.				
2	ADF Unit	Enables ADF operation.	0: No 1: Yes	0	
3	Key Counter	Enables key counter operation.	0: No 1: Yes	0	
4	Key Card	Used only in Japan.	0: No 1: Yes	0	
*5	Tape Marker Off	Disables tape marker operation.	0: No (Use the tape marker) 1: Yes	0	
*10.	Min. Print	Limits the minimum print quantity that can be entered.	0 to 9999	0	
*11	Max. Print	Limits the maximum print quantity that can be entered.	0 to 9999	9999	
*12	Set Display Mode	Selects the language used on the display. 0: Japanese 1: English 2: German 3: French 4: Italian 5: Spanish 6: Chinese 7: Dutch 8: Brazilian	0 to 8	1	
*13	Set Size Mode	Selects the metric size (mm) or inch size on the display.	0: mm 1: Inch	-	
14	Set Operation Panel	Selects the expression type on display that matches the machine.	0:JPN/CHN 1:OTHER	-	Never change the setting.
15	Set Drum Size	Selects the drum size that matches the machine. NOTE: This function is for production line use only.	0:B4 1:A4 2:LG	-	Never change the setting.
16	LCD Contrast Adjust	Changes the LCD contrast.	17 to 24	21	

No.	Display	Function	Settings	Factory Setting	Comments
17	Set Combine Key	Enables the Combine 2 Original mode. The blank key at the upper left corner under the top left cover on the operation panel is used as the mode key.	0: No 1: Yes	0	• Except for the China version model. • SP14 must be set at 0.
*20	Buzzer On	Turns the beeper on.	0: No 1: Yes	0	
*21	Prints/Master Cost	Adjusts the cost ratio of masters to prints for accounting purposes. (When SP4 is set at 1, This function cannot be used.)	0 to 50	0	The set number (0 to 50) is automatically added to the key counter each time a master is used.
22	Home Position Adjust	The drum home position (the master eject position) changes.	0 to 9	5	Never change the setting.
23	Plot Position Adjust	The drum stop position for the master making changes.	0 to 9	3	Never change the setting.
*25	Clear 2 In 1	Selects whether to reset the Combine 2 Original mode automatically after master making.	0: No 1: Yes	0	
26	Feed Timing Adjust	Adjusts the registration motor on timing for better paper registration.	0 to 7	3	
27	ADF Current Down	Lowers the current to the ADF motor.	0: No 1: Yes	0	If the ADF motor vibrates due to a part variation causing noise, reduce the motor current with this mode.
28	Paste Shadow Erase	Adjusts the Paste Shadow Erase level that can be set with the key on the operation panel. The shadows of pasted-up edges on originals lighten.	0: Standard 1: Light 2: Lighter	0	
*29	Pht Background Correct	Determines whether the original background correction is done in Photo mode.	0: Correction is not done. 1: Correction is done.	0	

No.	Display	Function	Settings	Factory Setting	Comments
30	Sub Scan Mag. Adjust	Adjusts the sub-scan magnification.	-1.9 to +1.9%	(0)	• For the platen mode • 0.1% steps • Use the Memory/ Class key for "+" or "-"
31	SCN Center Adjust	Adjusts the center position of copies in the platen mode.	-1.9 to +1.9 mm	0	• For the platen mode • 0.1 mm steps • Use the Memory/ Class key for "+" or "-" • See Remark 1
32	SCN Line Adjust	Adjusts the position of the scanner (CIS) in the ADF mode. If images cannot be scanned in the ADF mode, adjust the position. If the value is changed, perform SP38 also.	-1.9 to +1.9%	(0)	• This is for the production use only. • 0.1% steps • Use the Memory/ Class key for "+" or "-"
33	Lead Edge Adjust	Adjusts the lead edge margin.	4 to 10 mm	5	
34	Head Energy Adjust (Normal)	Adjusts the thermal head energy for the normal mode.	0 to -99%	(-0)	
35	Economy Head Energy Adjust	Adjusts the thermal head energy for the Economy mode.	0 to -99%	(-8)	
36	ADF Mag. Adjust	Adjusts the ADF sub-scan magnification.	-1.9 to +1.9%	(0)	• For the ADF mode • 0.1% steps • Use the Memory/ Class key for "+" or "-"
37	ADF Center Adjust	Adjusts the center position of copies in the ADF mode.	-1.9 to +1.9 mm	0	• For the ADF mode • 0.1 mm steps • Use the Memory/ Class key for "+" or "-" • See Remark 1

No.	Display	Function	Settings	Factory Setting	Comments
38	ADF Scan Line Adjust	Adjusts the ADF scanning start position.	-4.9 to 4.9 mm	(0)	• 0.1 mm steps. • Use the Memory/ Class key for "+" or "-". • See Remark 2
39	Trail Edge Adjust	Adjusts the blank margin at the trailing edge of prints.	0 to 3 mm	1	1 mm steps.
*40	Original	Specifies the image mode at power-up.	0: Letter 1: Lt/Photo 2: Photo	0	
*41	Image Density	Specifies the image density at power-up.	0: Light 1: Standard 2: Dark 3: Darker	1	
*42	Print Speed	Specifies the printing speed at power-up.	1: 80 rpm 2: 100 rpm 3: 120 rpm	2	
*43	Auto Cycle Mode	Specifies whether Auto Cycle mode is selected at power-up.	0: No 1: Yes	0	
*45	Std. Image Position	Specifies the image position at power-up.	40: +10mm | 20: 0 mm | 0: -10 mm	20	
52	Compress W Start Key	Compressing the ejected masters is done every time when the Start key is pressed for the master making.	0: No 1: Yes	0	See Remark 3
60	Clear All Memory	Returns all SP modes to the default settings.	0: No 1: Yes	0	The memory is cleared after pressing the Enter (#) key.
61	Clear Memory/ Except Adj.	Returns all SP modes to the default settings except for Adjustments.	0: No 1: Yes	0	The memory is cleared after pressing the Enter (#) key.
70	Original Feed Jam	Displays the total number of original jams.		0	
71	Paper Feed Jam	Displays the total number of paper feed jams.		0	
72	Paper Wrap Jam	Displays the total number of times that paper has accidentally wrapped around the drum.		0	

No.	Display	Function	Settings	Factory Setting	Comments
73	Paper Delivery Jam	Displays the total number of paper delivery jams.		0	
74	Master Feed Jam	Displays the total number of master feed jams.		0	
75	Master Delivery Jam	Displays the total number of master delivery jams.		0	
76	Clear Jam Counters	Clears all jam counters.	0: No 1: Yes	0	The memory is cleared after pressing the Enter (#) key.
*81	Quality Start No.	Specifies how many prints are made with the lowest drum rotation speed (30 rpm) to stabilize image density for the beginning prints after a new master is made.	0 to 3 sheets	0	This mode is to ensure that the first print has sufficient ink density even if the machine was not used for a long.
*82	Skip Feed No.	Specifies how many prints are skipped between prints in the skip feed mode.	1 to 9	2	"1" means no skip.
*84	Auto Multi Copy	Specifies the initial mode for the Combine 2 Originals mode.	0: No 1: Yes (Two identical images are made if the Master Making key is pressed once.)	0	
85	Initial Compression	Specifies whether full master box detection is made at power-up. Compressing the ejected masters is done.	0: No 1: Yes	1	See Remark 3
*87	Memory Print	Specifies the printing operation when in Memory mode.	0: Memory 1: Stack	0	See Remark 4
*88	Auto Memory/ Class	Specifies whether the Memory/Class mode is used.	0: No 1: Yes	0	See Remark 5
90	Thermal Head Test	Select "1" to carry out the thermal head test.	0: Off 1: On	0	See the Test Pattern Image Mode section.

No.	Display	Function	Settings	Factory Setting	Comments
91	CIS Test	Select "1" to carry out the CIS test. Select the photo mode and make a new master. If the CIS is damaged, white or black lines corresponding to damaged pixel elements will appear on prints.	0: Off 1: On	0	The mode is cancelled once a master is made or the power is turned off.
95	Scanner Free Run	Carries out a scanner free run test.	Start with the Print Start key. Stop with the Stop key.	0	
96	ADF Original Feed	Carries out an ADF original feed test.	Start with the Print Start key. Stop with the Stop key.		
98	Economy Count	Displays the total number of masters made in Economy mode.		0	
103	Margin Erase Count	Displays the total number of masters made with the Margin Erase key.		0	
104	On line Count	Displays the total number of masters made in On Line mode.		0	
105	Overlay Count	Displays the total number of masters made in Overlay mode.		0	
106	Enlarge Count	Displays the total number of masters made in Fixed Enlargement mode.		0	
107	Reduction Count	Displays the total number of masters made in Fixed Reduction mode.		0	
111	Total Count	Displays the total number of masters and prints.		0	M: Master count P: Print count
*113	Resettable Count	Used by the customer to display the total number of masters and prints.		0	M: Master count P: Print count
*114	CLR Reset-table Count	Clears the resettable total master/print counters.	0: No 1: Yes	0	
115	ADF Mode Count	Displays the total number of sheets fed in the ADF mode.		0	

No.	Display	Function	Settings	Factory Setting	Comments
116	Scanner Mode Count	Displays the total number of originals set in platen mode.		0	
117	Color Drum Count	Displays the total number of prints made using the color drum.		0	
119	CLR All Total Count	Clears the following counters: SP Nos. 111, 115, 116, and 117.	0: No 1: Yes		
*120 -1	User Code Mode	Selects user code mode.	0: No 1: Yes		See the user code mode section.
-2	Auto Reset Time	Selects the auto reset time.	0: Unlimited 1: 1 min. 2: 2 min. 3: 3 min. 4: 4 min. 5: 5 min.	0	Displays only when "Yes" is selected in SP120-1.
*121	UC Count	Displays the total number of masters and prints made with each user code.		0	Press the # key to shift to another user code.
*122	Clear UC Count	Clears the selected user code counter.	0: No 1: Yes	0	Same as above.
*123	Total UC Count	Displays the total number of masters and prints for up to 20 user codes.		0	
*124	Clear Total UC Count	Clears the total user code counter.	0: No 1: Yes	0	
130	Input Check Mode	Displays the inputs from sensors and switches.			See the input check table.
131	Output Check Mode	Turns on the electrical components.			See the output check table.
132	All Indicators ON	Turns on all the indicators on the operation panel.			Press the # key to light all the indicators.
135	SN: Master End	Displays the master end sensor voltage.			Unit: Volts
140	Ink Detection	Specifies whether ink detection is done.	0: No 1: Yes	1	
141	Paper Detection	Specifies whether paper end detection is done.	0: No 1: Yes	1	
142	Master End Detection	Specifies whether master end detection is done.	0: No 1: Yes	1	
146	ADF Cover Detection	This mode disables the ADF cover switch.	0: No 1: Yes	1	This function is valid only when SP2 is set at "1".

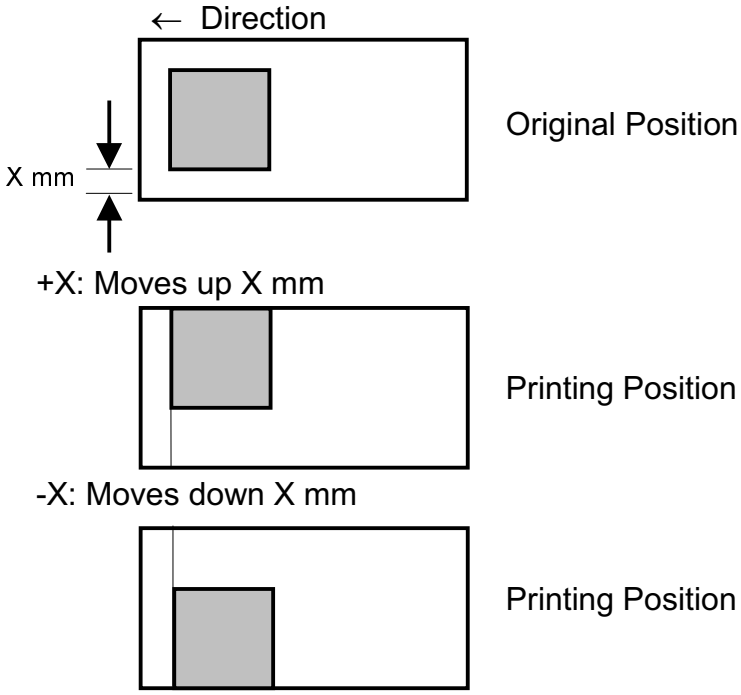
No.	Display	Function	Settings	Factory Setting	Comments
147	ADF Set Detection	This mode disables the platen cover sensor detection.	0: No 1: Yes	1	If "0" is selected, "Set the original" is displayed each time at master making.
150	Control ROM No.	Displays the ROM part number and the ROM manufacturing date.		P/No.	YYYY/MM/DD
151	Machine No.	Displays the machine serial number and the installation date.		0	Input the serial number and the installation date.
152	Service Tel. No.	Input the service representative's telephone number, which is displayed with the service call code.		0	• Use the number keys to input the telephone number at installation. • Press the Memory/ Class key if you wish to add a hyphen between the digits.
153	Last Service Code	Displays the last service call.		0	
*160	Side Ers.	Adjusts the default side edge margin width in the Margin Erase mode.	2 to 20 mm or 0.1 to 0.8 inch	5 mm or 0.2”	
*161	Center Ers.	Adjusts the default center margin width in the Margin Erase mode.	4 to 60 mm or 0.2 to 2.3 inch	10 mm or 0.4”	
*162	Horizontal Ers.	Adjusts the default horizontal edge (top and bottom) margin in the Margin Erase mode.	2 to 20 mm or 0.1 to 0.8 inch	5 mm or 0.2”	

No.	Display	Function	Settings	Factory Setting	Comments
*170	ERS. **1	Enter the original size (in "mm") that you want to use with the Margin Erase mode.	(100 to 258) x (100 to 364) mm or (4.0 to 10.0) x (4.0 to 14.3) inch	0 x 0	The original size entered is displayed by pressing the Select Size And Direction ("∧" or "∨") keys when in the Margin Erase mode.
*171	ERS. **2	Enter the original size (in "mm") that you want to use with the Margin Erase mode.	(100 to 258) x (100 to 364) mm or (4.0 to 10.0) x (4.0 to 14.3) inch	0 x 0	Same as above
*172	ERS. **3	Enter the original size (in "mm") that you want to use with the Margin Erase mode.	(100 to 258) x (100 to 364) mm or (4.0 to 10.0) x (4.0 to 14.3) inch	0 x 0	Same as above

Remarks

1. SP Mode No. 31 and 37 - SCN/ADF Center Adjust

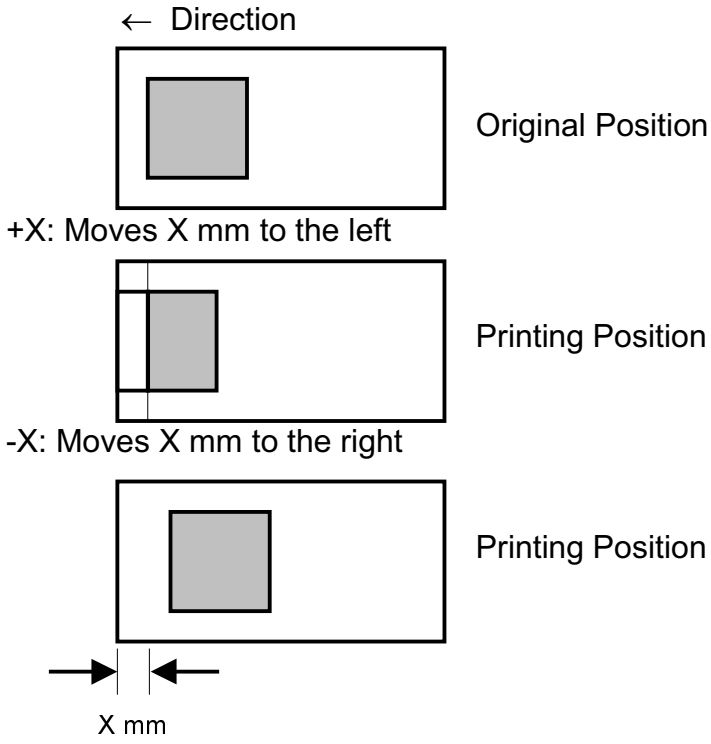
The printing position moves as shown below.



NOTE: When adjusting the scanner image position, input "0" first:
Example) X = 0.9 mm → "0", "9", then press the # key.

2. SP Mode No. 38 - ADF Scan Line Adjust

The printing position moves as shown below.



3. SP Mode No. 52 - Compress With Start Key, SP Mode No. 85 - Initial Compression

These modes eliminate the possible causes of master eject jams. If the operator continues to make masters even after the master eject box becomes full, the ejected masters interfere with the movement of the pressure plate, causing another master eject jam.

When these modes are selected, the full master box detection, with the master compressing operation, is carried out each time the machine is switched on (SP85) or the Start key is pressed to make a new master (SP52). Selecting SP52 affects the master processing time, so this is not enabled as the default. SP85 is enabled as the default.

4. SP Mode No. 87 - Memory Print

Normally, in Platen mode (when no originals are placed in the ADF) in combination with Memory mode, the machine stops when the 1st print job is finished even if the tape marker is installed, so that the next original can be placed. The next printing job (with the number of prints that has been set with Memory mode for the next original) starts when the Start key is pressed.

If "1" (Stack) is selected in this SP mode, after the 1st print job is finished, the next print job starts immediately afterwards. (The tape marker feeds a strip of tape to separate the jobs if it is used.)

In Platen mode in combination with Memory mode, the machine can print continuously depending on the numbers set with Memory mode for each print set, without replacing the original.

5. SP Mode No. 88 - Auto Memory/Class

In Memory/Class mode, the machine normally stops when the first print job is finished if the tape marker is not installed.
If "1" is selected in this mode, the machine stops for a while (this interval is the same as when the tape marker is operating). Then it continues with the next print (or master making) job.

4.4.3 INPUT/OUTPUT CHECK MODE

This program checks the electrical components.

Input/Output Check Mode Access Procedure

1. Access the SP mode. (See the SP mode access procedure.)
2. Enter 130 (for the Input Check mode) or 131 (for the Output Check mode) with the **number keys**.
3. Press the Enter (#) key.
4. Enter the desired number. (See the Input or Output Check Table.)

   NOTE: The number can be shifted up or down by pressing the **Select Size And Direction ("∧" or "∨") keys**.

5. Press the **Enter (#) key**.

   NOTE: In the input check mode, all printing speed LEDs turn on when the sensor or switch that is being tested is actuated. A beep will also be heard.

6. For the Output Check mode, press the **Start key** to turn on the component.
7. Press the **Enter (#) key** to return the display to the initial input or output check menu.
8. Press the **Clear Modes key** to leave the SP mode.

Input Check Table

Code	LCD Display	Component Checked
1.	SN: ADF Cover In- 1	ADF Cover Switch
2.	SN: 1st Original (ADF) In- 2	Document Sensor
3.	SN: 2nd Original (ADF) In- 3	Scan Line Sensor
18.	SN: Paper End In-18	Paper End Sensor
20.	SN: Paper Table Low Limit In-20	Table Lower Limit Sensor
21.	SN: Paper Height In-21	Paper Height Sensor
22.	KEY: Table Down In-22	Paper Table Lowering Switch
26.	SN: Master End In-26	Master End Sensor
27.	SIG: Ink In-27	When the Ink Detecting Pin detects ink
31.	SN: Pressure Plate Home Position In-31	Pressure Plate Home Position Sensor
32.	SN: Pressure Plate Limit Position In-32	Pressure Plate Limit Sensor
33.	SW: Master Eject Box In-33	Eject Box Set Sensor
39	SIG: Key Counter In-39	When a key counter is installed
42	SN: Paper Exit In-42	Paper Exit Sensor
43	SN: Master Eject In-43	Master Eject Sensor
44	SN: Drum Master In-44	Drum Master Sensor
45	SN: Scanner Home Position In-45	Scanner Home Position Sensor
47	SN: Platen Set In-47	Platen Cover Sensor
51	SW: Plotter Cover In-51	Master Making Unit Cover Safety Switch
52	SW: Cover Open In-52	Door Safety Switch Scanner Unit Safety Switch

Code	LCD Display	Component Checked
53	SN: Cutter Home Position In-53	Cutter Home Position Sensor
54	SN: Master Set Cover In-54	Master Set Cover Sensor
56	SN: Feed Start Timing In-56	Feed Start Timing Sensor
57	SN: 2nd Feed Timing In-57	2nd Feed Timing Sensor
58	SN: Paper Exit Timing In-58	Paper Exit Timing Sensor
59	SN: Master Eject Position In-59	Master Eject Position Sensor
62	SN: Drum Set In-62	When the drum connector is connected
65	SN: Clamper Close In-65	Clamper Close Sensor
66	SN: Clamper Open In-66	Clamper Open Sensor
68	SN: Registration In-68	Paper Registration Sensor

Output Check Table

Code	LCD Display	Description
3	MOTOR: Master Eject Out- 3	Turns on the master eject motor.
6	MOTOR: Vacuum Out- 6	Turns on the vacuum fan motor.
7	MOTOR: Air Knife Out- 7	Turns on the air knife fan motor.
8	SIG: Key Counter Out- 8	Increments the key counter.
9	COUNTER: Master Out- 9	Increments the master counter.
10	COUNTER: Paper Out-10	Increments the paper counter.
12	MOTOR: Ink Supply Out-12	Turns on the ink pump motor.
14	SOL: Print Pressure Out-14	Turns on the pressure release solenoids. At the same time, it turns on the paper transport motor.
18	MOTOR: Paper Table Down Out-18	Turns on the paper table motor (down).
19	MOTOR: Paper Table Up Out-19	Turns on the paper table motor (up).
21	SIG: Fluorescent Lamp Out-21	Turns on the xenon lamp.
22	MOTOR: Cutter + Direction Out-22	Turns on the cutter motor.
23	MOTOR: Cutter Home Out-23	Turns on the cutter motor and moves the cutter to the home position.
27	MOTOR: Drum Home Stop Out-27	Turns on the main motor and moves the drum to the home position.
28	MOTOR: Drum Plot Stop Out-28	Turns on the main motor and moves the drum to the master making position.
33	MOTOR: Original Feed Out-33	Turns on the ADF motor.
34	MOTOR: Master Feed High Speed Out-34	Turns on the master feed motor at high speed.
35	MOTOR: Master Feed Low Speed Out-35	Turns on the master feed motor at low speed.

Code	LCD Display	Description
36	MOTOR: Master Feed Normal Speed Out-36	Turns on the master feed motor at normal speed.
37	MOTOR: Scanner	Turns on the scanner motor. The scanner moves to the original scanning position for ADF mode when the Start key is pressed. It returns to home position when the Start key is pressed again.
41	SIG: VHD on Out-41	Applies thermal head voltage. Power is applied by pressing the Start key. It is stopped by pressing the Clear/Stop key.
42	MC: Paper Feed Out-42	Turns on the paper feed clutch.
43	MOTOR: Paper Delivery Out-43	Turns on the paper transport motor while the Start key is pressed.
44	MOTOR: Clamper Close Out-44	Turns on the clamper motor and moves to the clamper close position.
45	MOTOR: Clamper Open Out-45	Turns on the clamper motor and moves to the clamper open position.
46	MOTOR: Pressure Plate ON Out-46	Turns on the pressure plate motor and moves the plate to the lower limit position.
47	MOTOR: Pressure Plate OFF Out-47	Turns on the pressure plate motor and moves the plate to the home position.

4.5 TEST PATTERN IMAGE MODE

This function is used to determine which printer component is causing an image quality problem on the master.

In this mode, the background pattern that is printed covers the entire sheet of paper.

- Procedure -

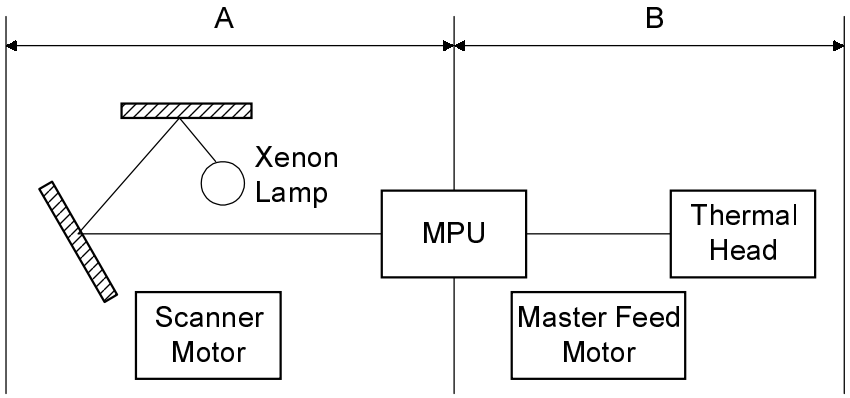
1. Place paper on the paper table.
   NOTE: To reduce thermal head load, use the smallest paper size possible, i.e. the smallest paper width on which the part with the image problem can be printed.
2. Access SP mode.
3. Input **SP number 90** and enter "1". Then, press the **Enter (#) key**.
4. Press the **Clear Modes key** to leave the SP mode.
5. Carry out the master making process (an original is not necessary).
6. Make some prints and check the image.

NOTE: The SP mode number 90 setting returns to the default (0) after the above procedure.

- Assessment -

If the printout is normal, a Part A component is defective.

If the printout is abnormal, a Part B component is defective.



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4.6 USER CODE MODE

With the user code function (SP mode number 120), operators must input an authorized code before the machine will operate. The machine keeps track of the number of prints made under each code.

There are 20 user codes as follows:

No.	User Code No.
1	382
2	191
3	182
4	173
5	164
6	155
7	146
8	137
9	128
10	119
11	482
12	291
13	282
14	273
15	264
16	255
17	246
18	237
19	228
20	219

- How to use a user code -

1. Enter the user code (3 digits) with the **number keys**.
2. Press the **Enter (#) key**.
3. Press the **Start key** to start printing.

NOTE: The user code is reset if the **Clear Modes key** and the **Clear/Stop key** are pressed together. The user then has to input a user code to use the machine.

5. PREVENTIVE MAINTENANCE

5.1 MAINTENANCE TABLE

The following items should be maintained periodically. There are two sets of intervals - one based on time and the other based on print count. For maintenance items with entries in both of them, use whichever comes first.

C: Clean, R: Replace, L: Lubricate, A: Adjust

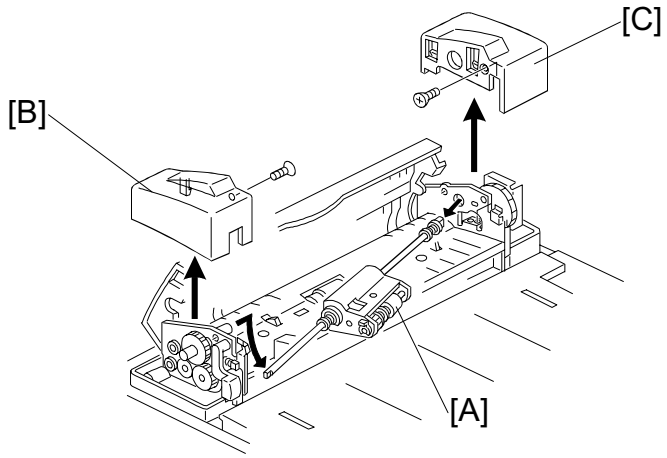
Interval / Item	Time				Print Counter					EM	NOTE
	6M	1Y	2Y	3Y	300K	600K	1M	1.2M	2M		
Scanner/Optics											
Exposure Lamp	C	C	C	C							Dry Cloth
Mirror/Reflector	C	C	C	C							Soft Cloth
Platen Cover / White Plate	C	C	C	C							Damp Cloth
Exposure Glass	C	C	C	C							Dry Cloth
Master Feed											
Thermal Head										C	Alcohol
Platen Roller Expected life: 6K masters	C	C	C	R							Damp cloth and water
Master Eject Rollers	C	C	C	C							Alcohol
Drum Master Sensor										C	Dry Cloth
Paper Feed											
Paper Pick-up Roller	C	R	R	R		R		R			Damp Cloth
Paper Feed Roller	C	R	R	R		R		R			Damp Cloth
Friction Pad	C	R	R	R		R		R			Damp Cloth
Press Roller	C	C	R	C				R			Alcohol
Paper Feed Clutch									R		
Feed Roller and Transport Belt Roller Bushings		L	L	L							Motor Oil (SAE #20)
Feed Drive Gears		L	L	L							Grease (Alvania #2)
Paper Delivery Transport Belts			R					R			
Paper End Sensor	C	C	C	C							Dry Cloth
Registration/Exit Sensors	C	C	C	C							Dry Cloth
Registration Roller	C	C	C	C							Dry Cloth

Interval / Item	Time				Print Counter					EM	NOTE
	6M	1Y	2Y	3Y	300K	600K	1M	1.2M	2M		
Drum and Ink Supply											
Cloth Screen			R					R			
Drum Drive Gears and Cam		L	L	L							Grease (Alvania #2)
Drum Flange Bushing		L	L	L							Motor Oil (SAE #20)
In/Outside of Drum	C	C	C	C							Alcohol
Ink Nozzle	C	C	C	C							Alcohol
Others											
Main Drive Timing Belt Tension			A								
Press Roller Release Lever Position			A								
ADF (Option)											
DF Pick-up, Reverse, Feed Rollers	C	C	C	C							Dry Cloth
DF R1, R2, R3 Rollers	C	C	C	C							Dry Cloth

6. REPLACEMENT AND ADJUSTMENT

6.1 EXTERIOR COVER REMOVAL

6.1.1 ADF



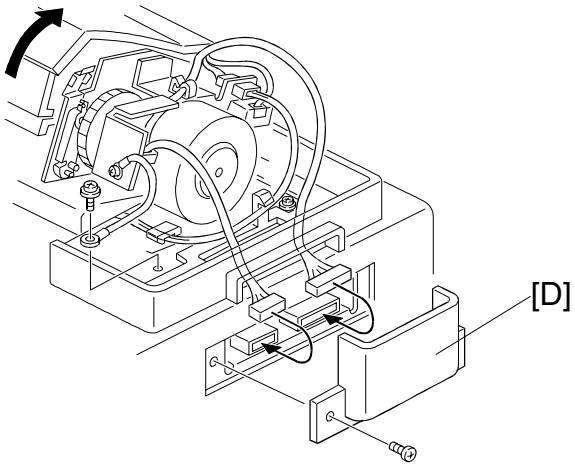
C231R500.WMF

First, remove the ADF roller assembly [A].

A: ADF Roller Assembly

B: ADF Upper Front Cover (1 screw, 1 hook)

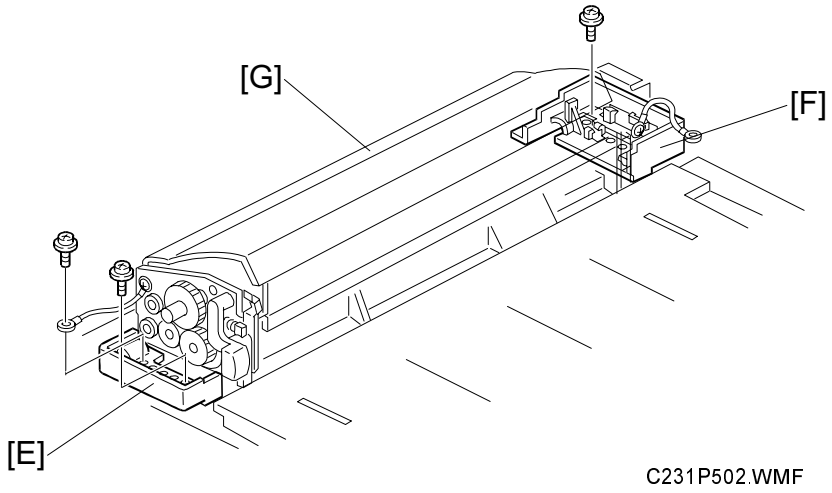
C: ADF Upper Rear Cover (1 screw, 2 hooks)



C231P501.WMF

Remove the connector cover, then remove the harness and ground wire.

D: Connector Cover (1 screw)

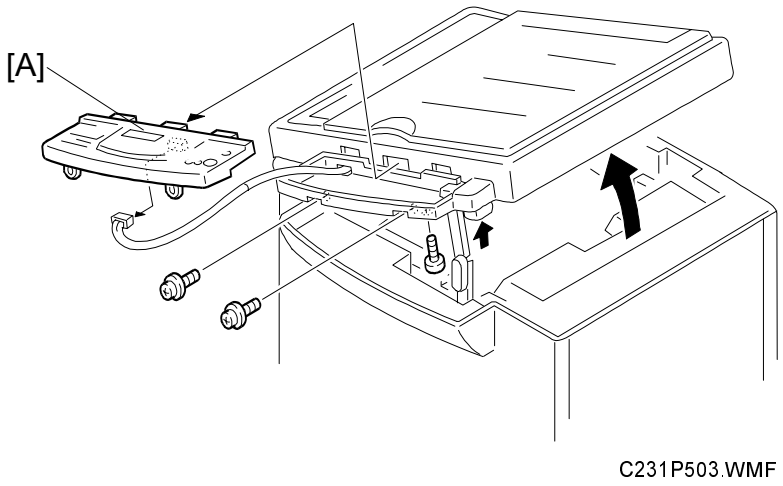


E: ADF Lower Front Cover (2 screws, 1 grounding wire)

F: ADF Lower Rear Cover (2 screws, 1 grounding wire)

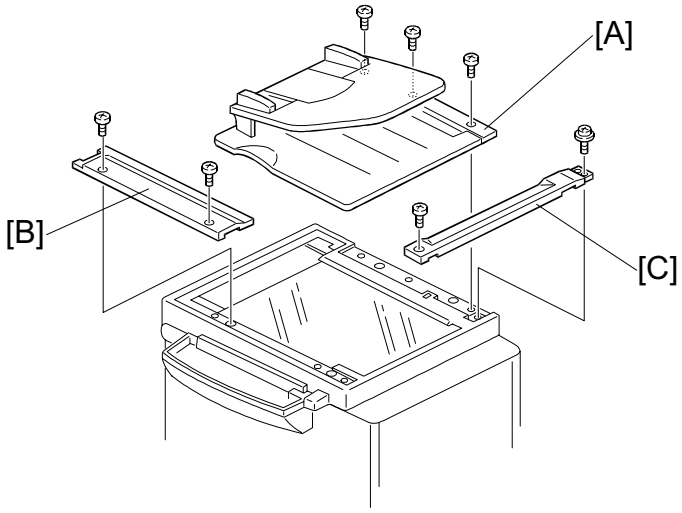
G: ADF Unit (2 connectors)

6.1.2 OPERATION PANEL



A: Operation Panel Assembly (2 tapping screws)

6.1.3 PLATEN COVER AND UPPER COVERS



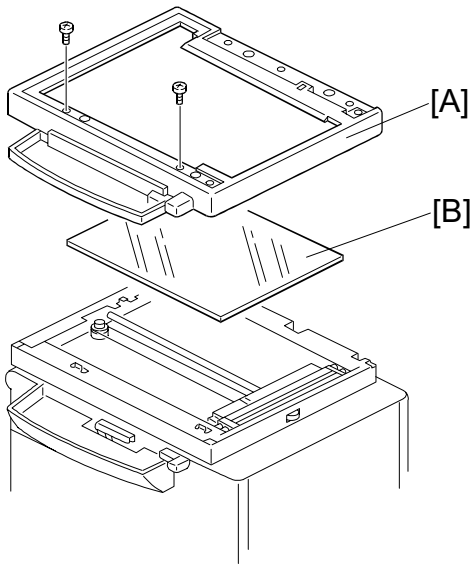
C231P504.WMF

A: Platen Cover (3 tapping screws)

B: Horizontal Upper Cover (2 silver screws)

C: Vertical Upper Cover (1 silver screw, 1 screw)

6.1.4 TOP COVER AND EXPOSURE GLASS

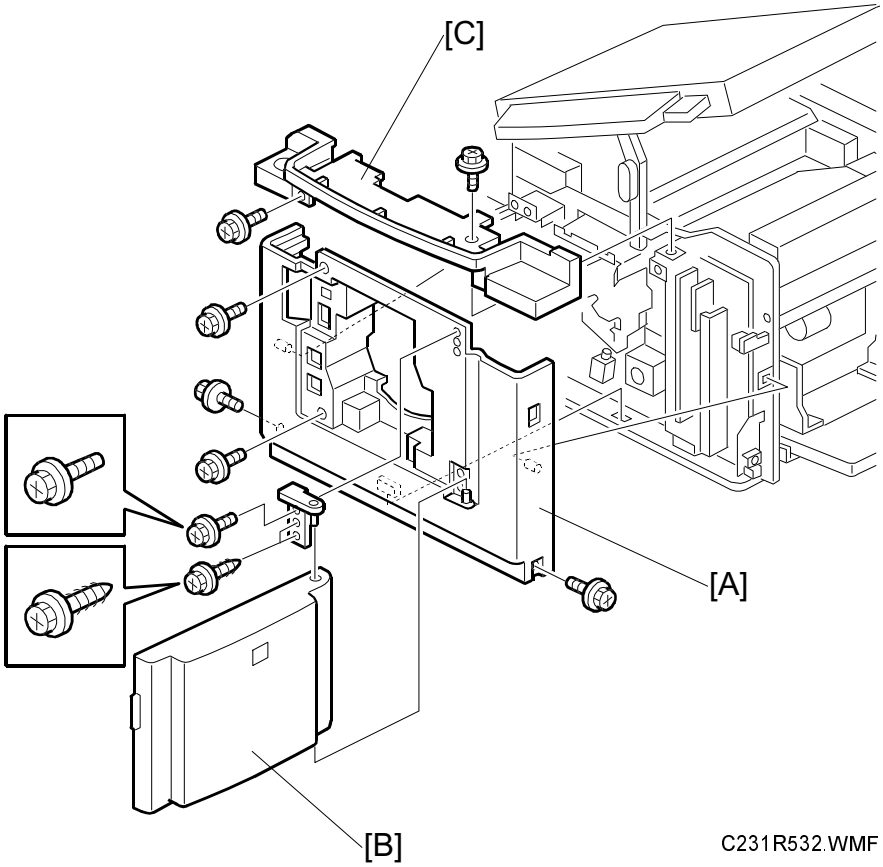


C231P505.WMF

A: Top Cover (2 screws)

B: Exposure Glass

6.1.5 OTHER COVERS

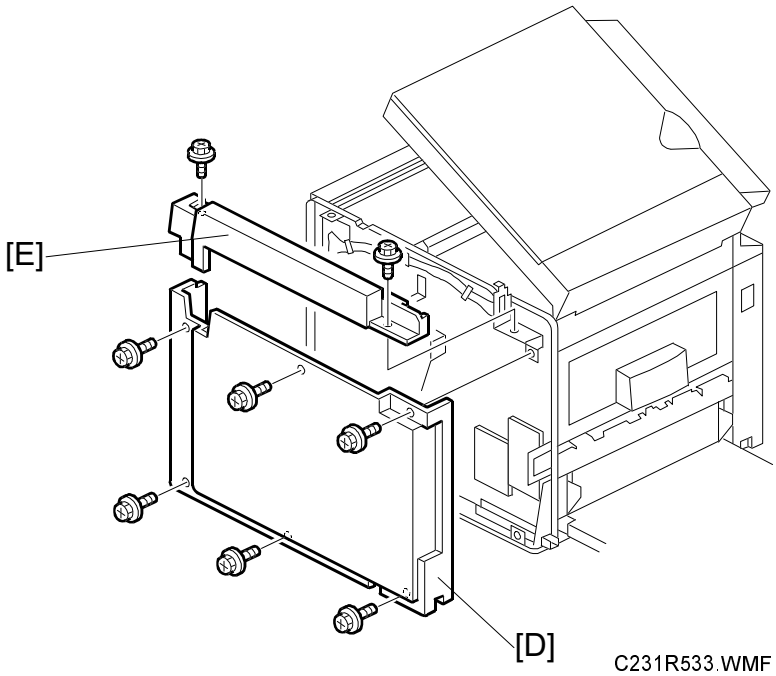


A: Front cover (5 screws).

B: Front door (2 screws).

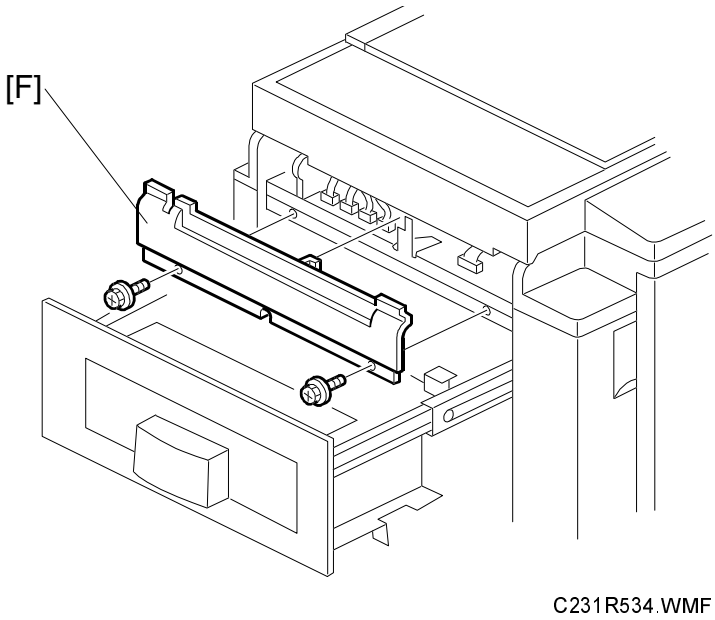
NOTE: The two screws are different in shape each other, as shown.

C: Operation panel under cover (2 screws).



D: Rear cover (6 screws).

E: Rear upper cover (2 screws).



F: Left upper cover (2 screws).

6.2 COPY IMAGE ADJUSTMENT

6.2.1 LEADING EDGE REGISTRATION ADJUSTMENT

PURPOSE: To adjust the leading edge registration on prints in platen mode and ADF mode.

ADJUSTMENT STANDARD:

Within 0 ± 2.0 mm (in platen mode)

Within 0 ± 2.5 mm (in ADF mode)

CAUTION: This adjustment is required every time the MPU has been replaced.

1. Turn on the main switch, and make a copy in platen mode.

   NOTE: The image position on the trial print that is automatically made after making a master tends to be inconstant. Do not use the trial print to check the copy image.

2. Measure the difference between the leading edge registration of the original and the print. If the registration does not meet specifications, go to the next step.
3. Access SP26 (Feed Timing Adjustment).
4. Adjust the gap.
5. Exit the SP mode and make a copy.
6. Re-measure the leading edge registration to ensure it is within specifications. If the registration meets specifications, go to the next step.
7. Make a copy in ADF mode and repeat the same steps using SP38 (ADF Scan Line Adjustment). The specification in ADF mode is 0 ± 2.5 mm.

   NOTE: SP38 changes the scanning start timing in the ADF mode, changing the leading edge registration in the ADF mode.

6.2.2 SIDE-TO-SIDE REGISTRAION ADJUSTMENT

PURPOSE: To adjust the side-to-side image position on prints by changing the main-scan positions in platen and ADF modes.

ADJUSTMENT STANDARD:

Within 0 ± 2.0 mm (in platen mode)

Within 0 ± 2.5 mm (in ADF mode)

CAUTION: This adjustment is required every time the MPU has been replaced.

1. Turn on the main switch, and make a copy in platen mode.

   NOTE: The image position on the trial print that is automatically made after making a master tends to be inconstant. Do not use the trial print to check the copy image.

2. Measure the difference between the side-to-side edge registration of the original and the print. If the registration does not meet specifications, go to the next step.
3. Access SP31 (Scan Center Adjustment - Platen Mode).
4. Adjust the gap.
5. Exit the SP mode and make a copy.
6. Re-measure the side-to-side registration to ensure it is within specifications. If the registration meets specifications, go to the next step.
7. Make a copy in ADF mode and repeat the same steps using SP37 (ADF Center Adjustment - ADF Mode). The specification in ADF mode is 0 ± 2.5 mm.

6.2.3 VERTICAL MAGNIFICATION ADJUSTMENT

PURPOSE: To adjust the vertical magnification to within the adjustment standard by changing the scanning speeds in platen and ADF modes.

ADJUSTMENT STANDARD:

Within 100 ± 1.0%

CAUTION: This adjustment is required every time the MPU has been replaced.

1. Turn on the main switch, and make a copy in platen mode.

   NOTE: The image position on the trial print that is automatically made after making a master tends to be inconstant. Do not use the trial print to check the copy image.
2. Measure the difference between the magnification of the original and the print. If the vertical magnification does not meet specifications, go to the next step.
3. Access SP30 (Scan Magnification Adjustment).
4. Adjust the value.
5. Exit the SP mode and make a copy.
6. Check the vertical magnification again to ensure it is within specifications. If the vertical magnification meets specifications, go to the next step.
7. Make a copy in ADF mode and repeat the same steps using SP 36 (ADF Magnification Adjustment).

6.2.4 LEADING EDGE BLANK MARGIN ADJUSTMENT

PURPOSE: To adjust the leading edge blank margin.

ADJUSTMENT STANDARD:

Within 5 mm

CAUTION: This adjustment is required every time the MPU has been replaced.

1. Turn on the main switch, and make a copy in platen mode.

   NOTE: The image position on the trial print that is automatically made after making a master tends to be inconstant. Do not use the trial print to check the copy image.

2. Measure the leading blank margin on the print. If the blank margin does not meet specifications, go to the next step.
3. Access SP33 (Lead edge Adjustment).
4. Adjust the value.
5. Exit the SP mode and make a copy.
6. Check the leading edge blank margin again to ensure it is within specifications.

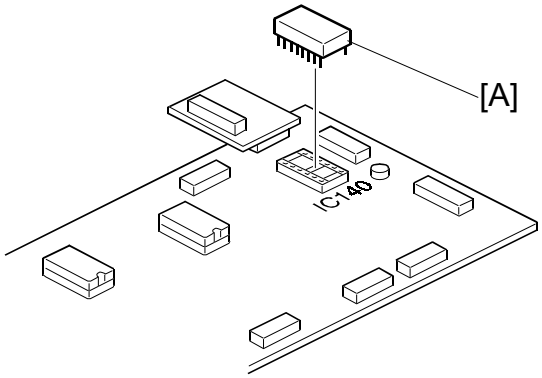
6.3 MPU REPLACEMENT

SP mode data and other adjustment data are stored in the backup RAM on the MPU.

Therefore, after replacing the MPU, be sure to do the following:

1) Vertical magnification adjustment (SP30, 36)
2) Side-to-side registration adjustment (SP31, 37)
3) Leading edge margin adjustment (SP33)
4) Leading edge registration adjustment (SP26, 38)
5) Correct drum type select (SP15)

NOTE: If you use the backup RAM [A] (IC140) on the old MPU for the new MPU, all data, including data in the SP mode, will be restored. You do not have to do the above procedures. (The battery inside the RAM can hold data even if the RAM is removed from the MPU.)



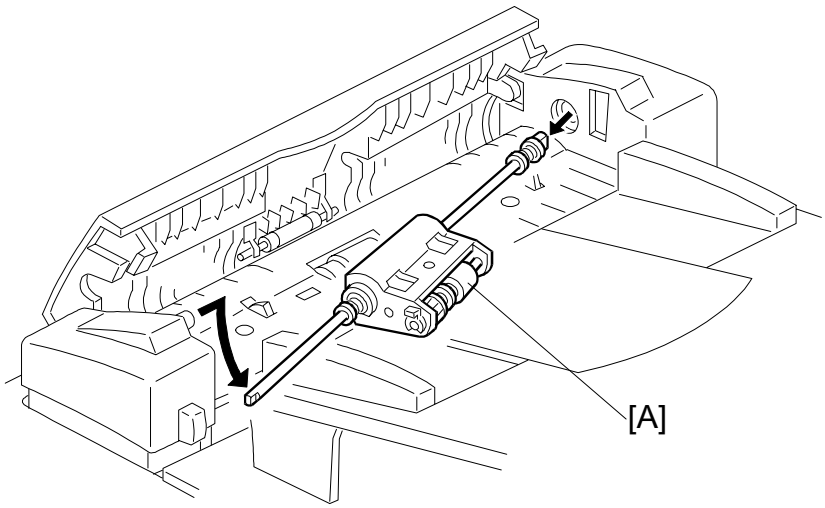
C229R503.WMF

The following adjustments are needed even when you use the backup RAM from the old MPU on the new one:

1) Ink detection adjustment
2) Master end sensor adjustment

6.4 ORIGINAL FEED SECTION

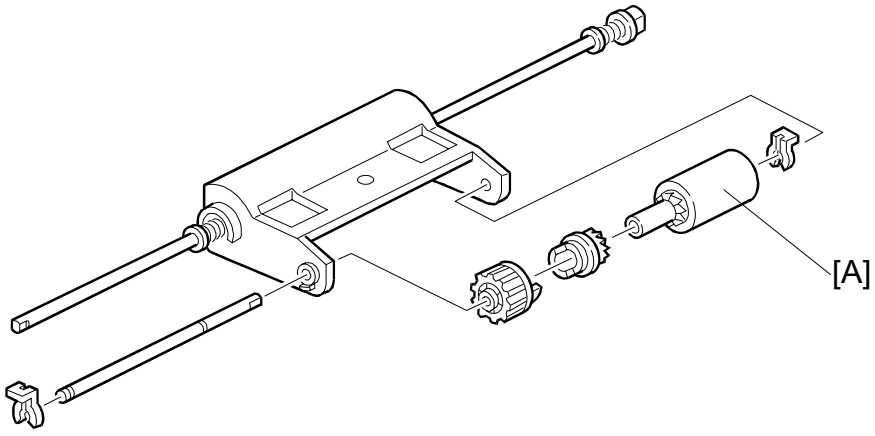
6.4.1 ADF ROLLER ASSSEMBLY



C231P507.WMF

A: ADF Roller Assembly

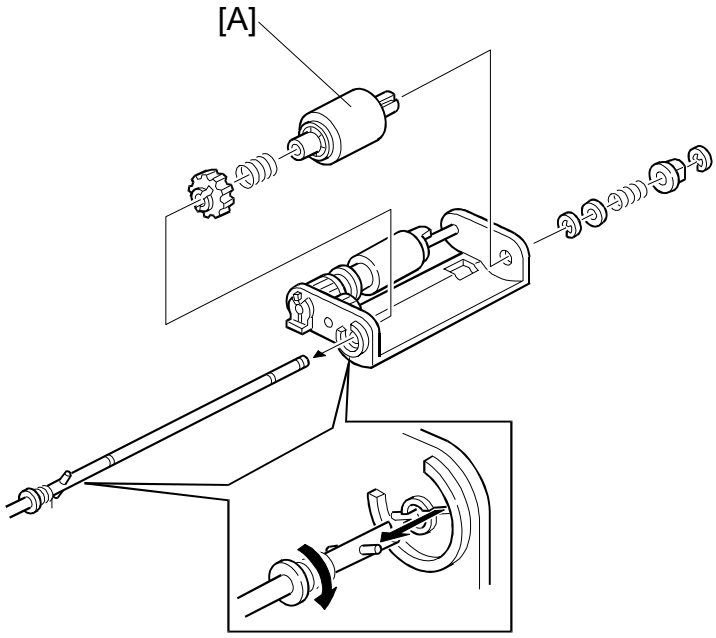
6.4.2 PICK-UP ROLLER



C231P508.WMF

A: Pick-up Roller (2 clips, 2 gears)

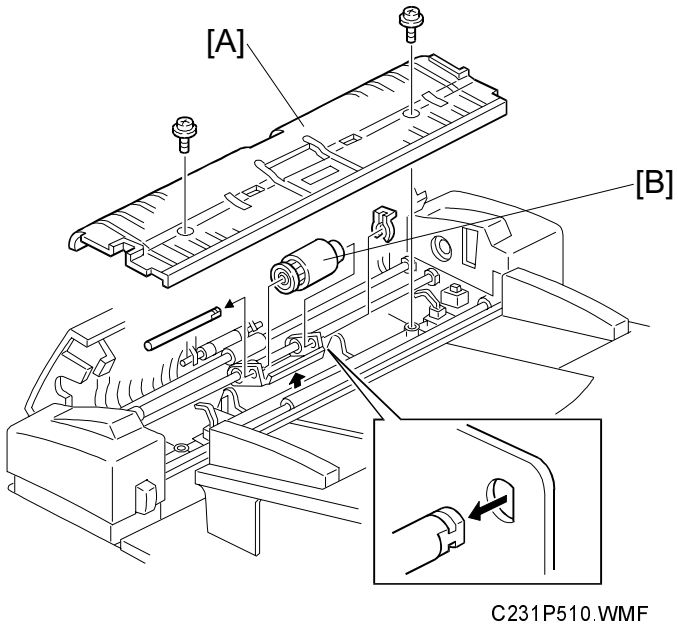
6.4.3 FEED ROLLER



C231P509.WMF

A: Feed Roller (1 clip, 1 gear, 2 springs, 2 E-rings, 1 washer)

6.4.4 SEPARATION ROLLER

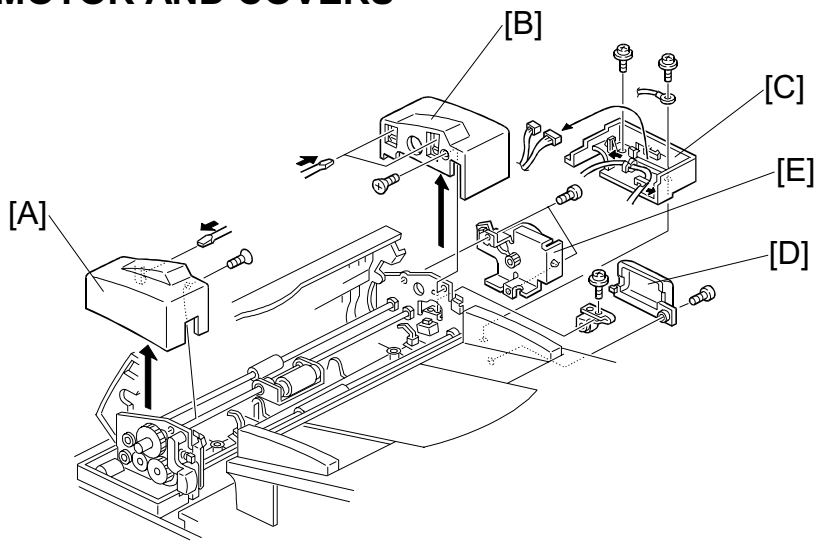


C231P510.WMF

A: Upper Guide Plate (2 tapping screws)

B: Separation Roller (1 clip)

6.4.5 ADF MOTOR AND COVERS



C231P511.WMF

A: ADF Upper Front Cover (1 screw, 1 hook)

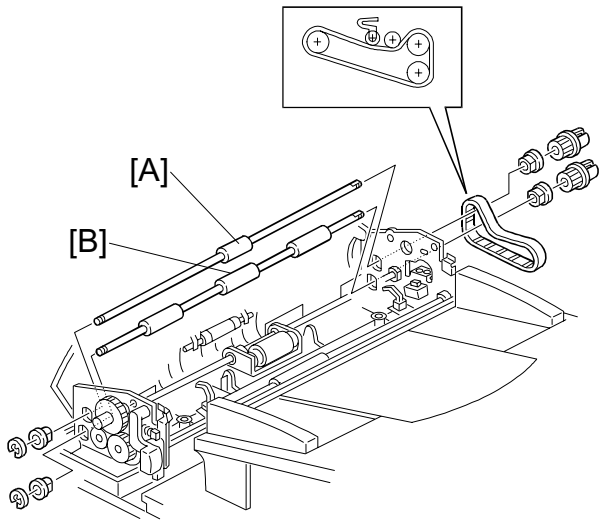
B: ADF Upper Rear Cover (1 screw, 2 hooks)

C: ADF Lower Rear Cover (2 screws)

D: Connector Cover (1 screw)

E: ADF Motor (2 screws)

6.4.6 R0 AND R1 ROLLERS

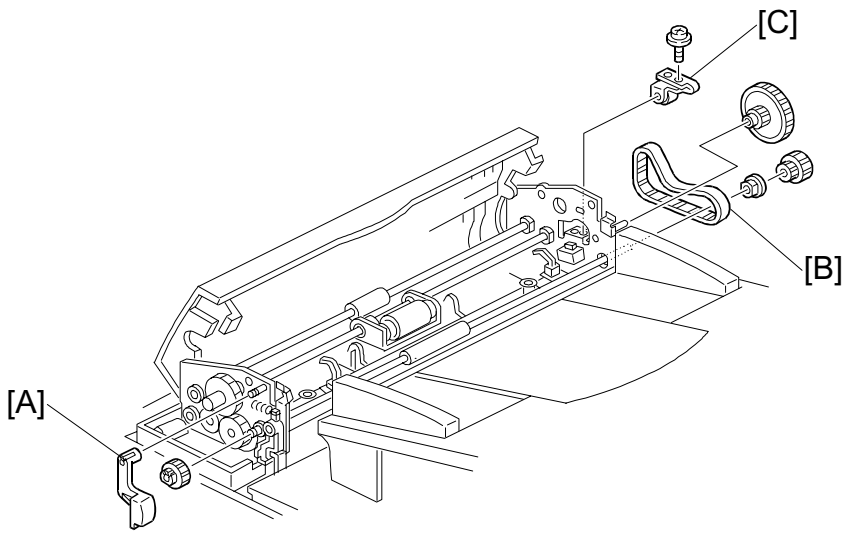


C231P512.WMF

A: R0 Roller (1 E-ring, 1 gear, 2 bushings)

B: R1 Roller (1 E-ring, 1 gear, 2 bushings)

6.4.7 R2 ROLLER

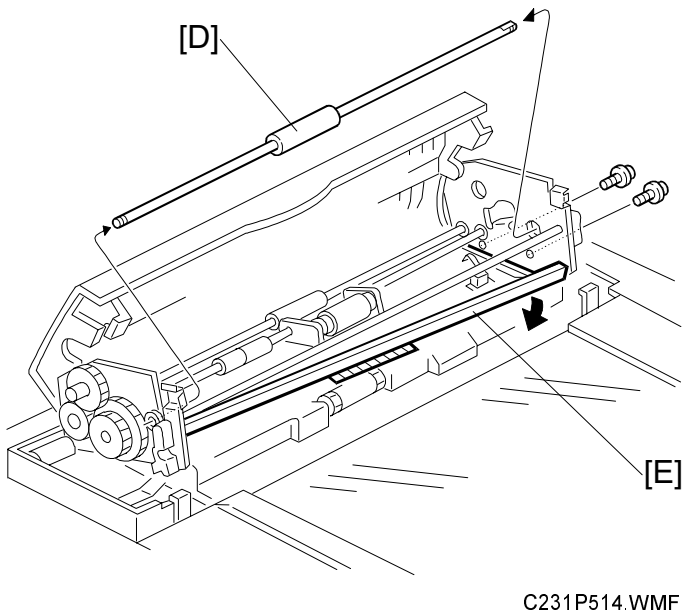


C231P513.WMF

A: ADF Release Lever

B: Timing Belt

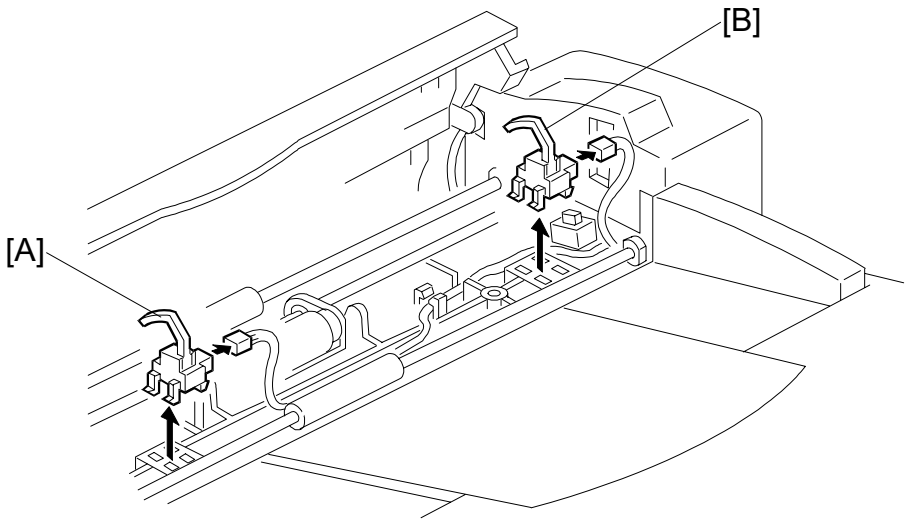
C: Tensioning Roller Ass'y (1 screw)



C231P514.WMF

Remove the R2 roller [D] while lowering the guide plate [E].

6.4.8 DOCUMENT SENSOR

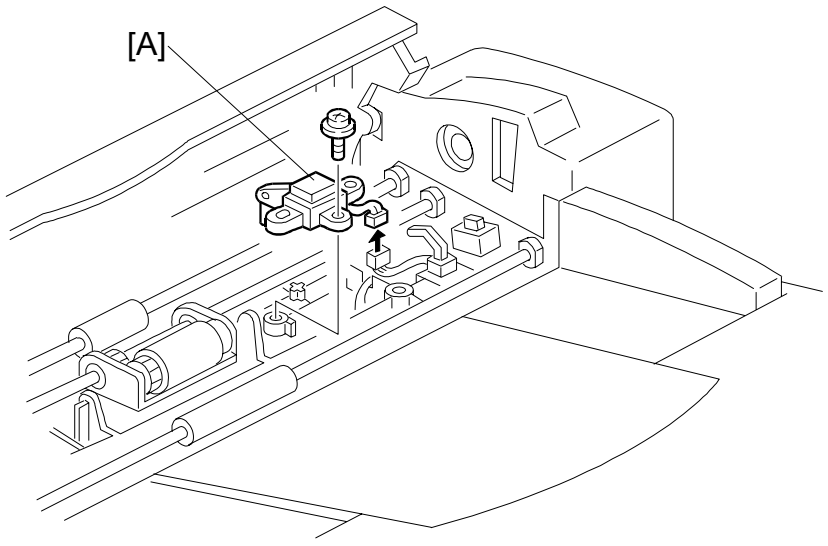


C231P515.WMF

A: Document Sensor

B: This sensor has no function

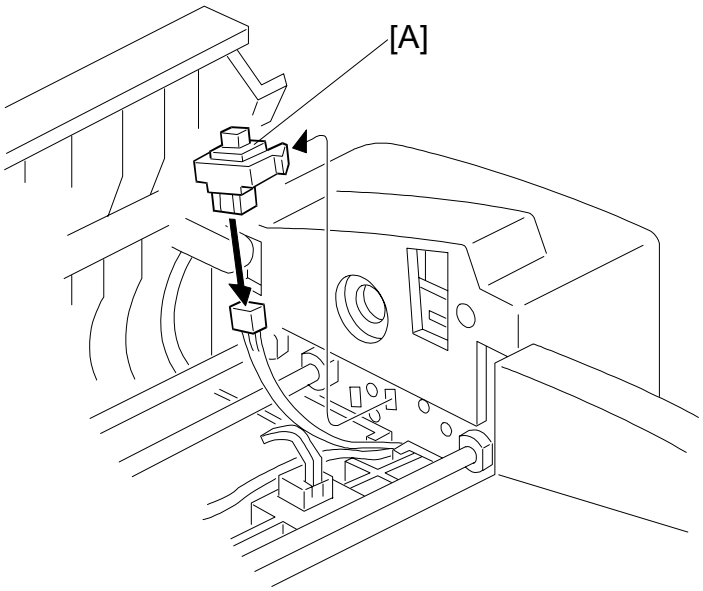
6.4.9 SCAN LINE SENSOR



C231P516.WMF

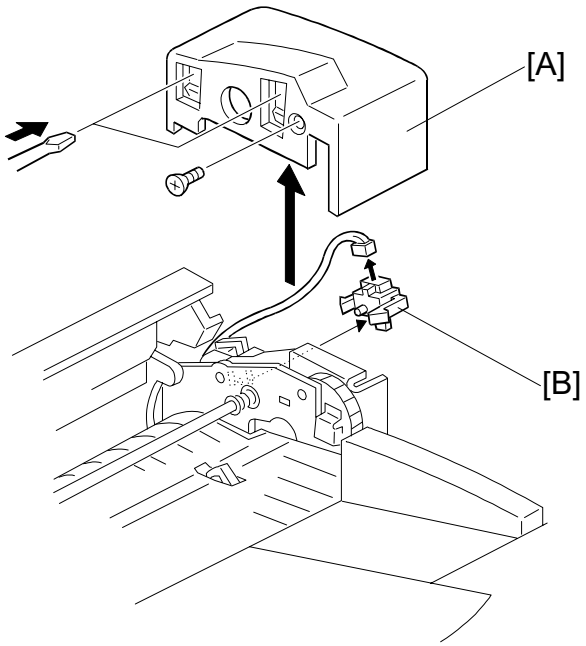
A: Scan Line Sensor (1 screw)

6.4.10 COVER SENSORS



C231P517.WMF

A: ADF Cover Switch



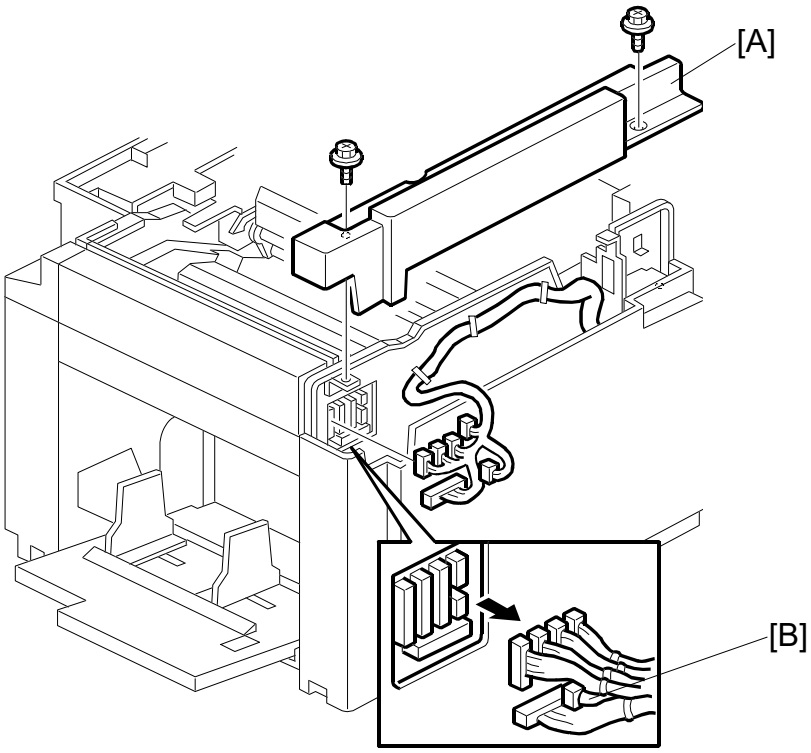
C231P518.WMF

A: Upper Rear Cover (1 screw, 2 hooks)

B: ADF Switch

6.5 MASTER FEED SECTION

6.5.1 MASTER MAKING UNIT REMOVAL



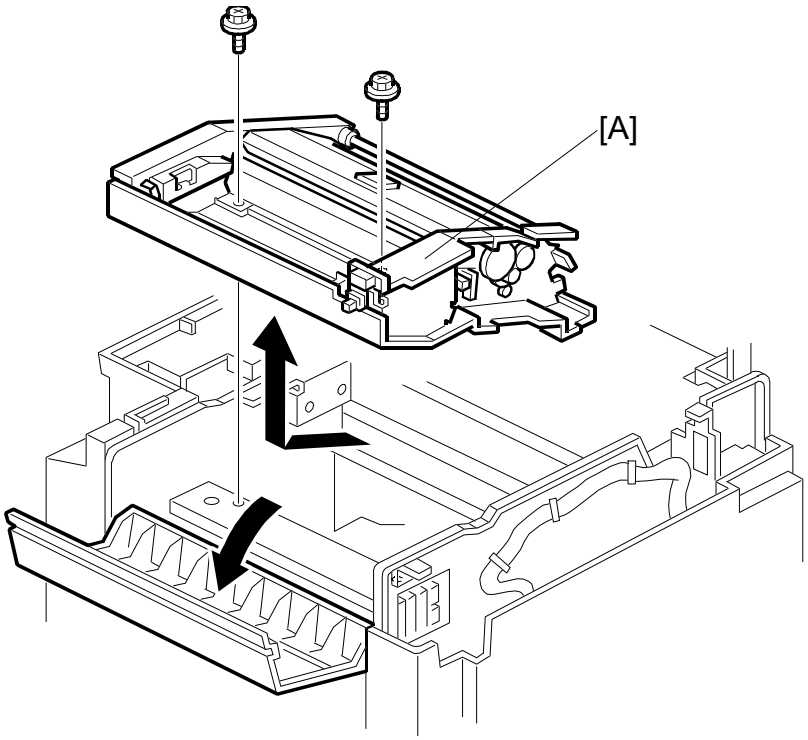
C231R521.WMF

First, turn off the main switch and disconnect the power plug.

Then open the scanner unit.

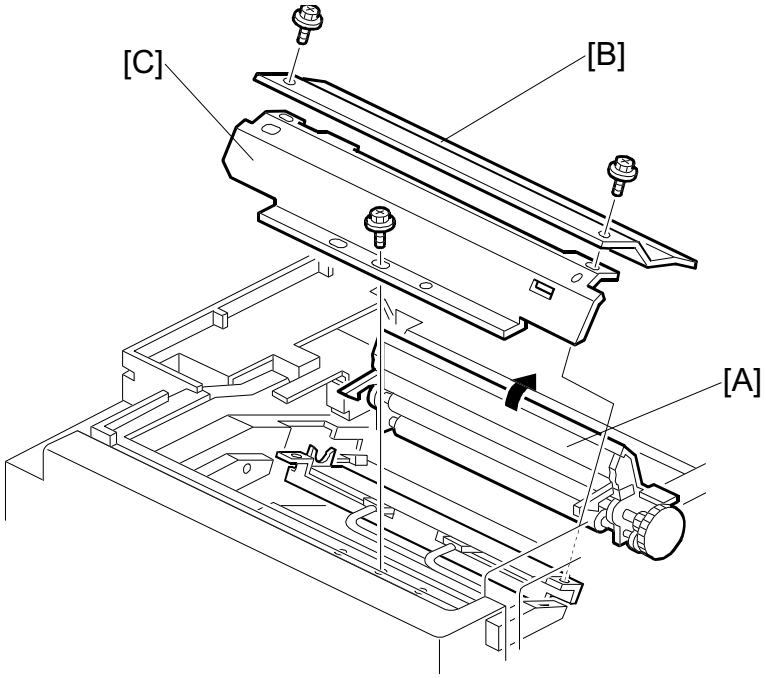
A: Rear upper cover (2 screws)

B: Disconnect 6 connectors



A: Master making unit (2 screws)

6.5.2 THERMAL HEAD REMOVAL



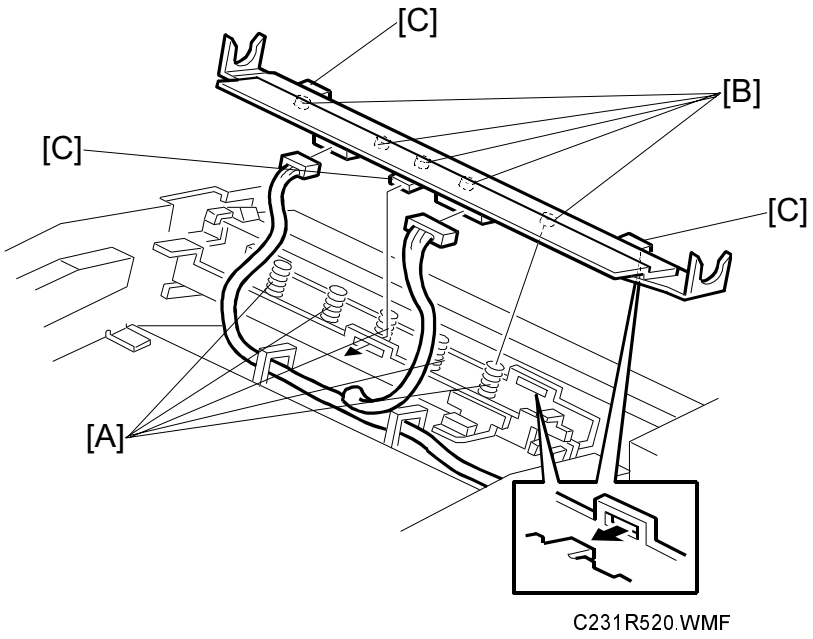
C231R519.WMF

⚠CAUTION

If the thermal head has been replaced, the input voltage must be adjusted. Refer to "Thermal Head Voltage Adjustment".

1. Turn off the main switch and disconnect the power plug.
2. Remove the master making unit. (See Master Making Unit Removal.)
3. Open the platen roller unit [A].
4. Remove the thermal head upper cover [B] (2 screws).
5. Remove the thermal head side cover [C] (1 screw).
6. Remove the thermal head connector (2 connectors).
7. Unhook the lock pawls of the thermal head (3 lock pawls). Make sure to unhook the two rear sides (the drum side) first. (See the illustration on the following page.)
8. Remove the thermal head.

Remarks for thermal head installation



If the following remarks are not followed, the thermal head will be installed incorrectly.

1) Fit the base's springs [A] over the protrusions [B] on the underside of the thermal head (5 points).

2) While fitting the tops of the springs [A] over the protrusions on the underside of the thermal head, hook the lock pawls [C] of the thermal head onto the base (3 lock pawls). Make sure to set the front side (the paper table side) first.

3) The spring in the middle is longer than the other ones. Therefore, set the central protrusion first, then fit the other protrusions into the springs. Make sure that all protrusions are properly fit into the springs. As you remove the master making unit from the machine, you can check if the springs are fitted properly from the tension roller side.

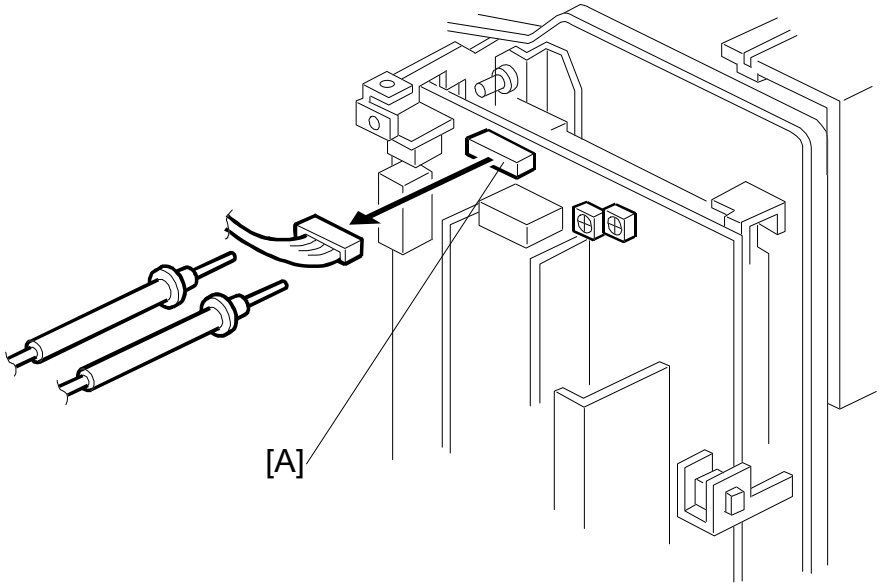
6.5.3 THERMAL HEAD VOLTAGE ADJUSTMENT

PURPOSE: To maintain master making quality and extend the lifetime of the thermal head.

ADJUSTMENT STANDARD:

Refer to the voltage value (X) printed on the thermal head. The value varies from one thermal head to another.

The adjustment voltage should be between X and X - 0.1 V.

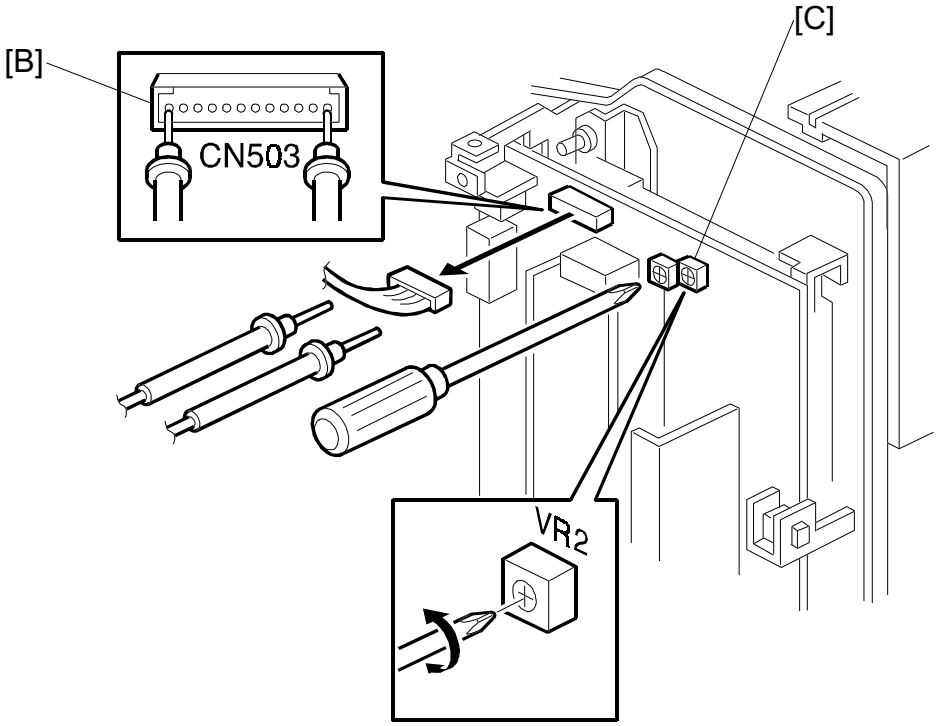


C231R549.WMF

⚠CAUTION

This adjustment is always required when the thermal head or power supply unit has been replaced.

1. Turn off the main switch and disconnect the power plug.
2. Remove the front cover and panel cover (6 screws).
3. Disconnect CN503 [A] on the power supply unit.
4. Read the voltage value on the decal on the thermal head.
5. Connect the power plug, and turn on the main switch to access SP mode.
6. Select the thermal head power supply mode (SP 131 - 41).



7. Press the Start key. The power to the thermal head is continually applied. Press the Stop key if you cannot finish the adjustment quickly.

   NOTE: A beeper sounds while the power is supplied.

8. Measure the voltage between the output terminal and the grounding terminal of CN503.

⚠CAUTION
Use the outside terminals of the connector as shown [B] to measure the voltage. If the output and ground terminals touch each other, the board will be damaged.

9. Turn VR2 [C] so that the value becomes between "+0" and "-0.1" volts from the value on the thermal head decal.

⚠CAUTION
Never turn VR2 [C] clockwise rapidly while the connector is connected. The thermal head will be damaged if too much voltage is supplied suddenly.

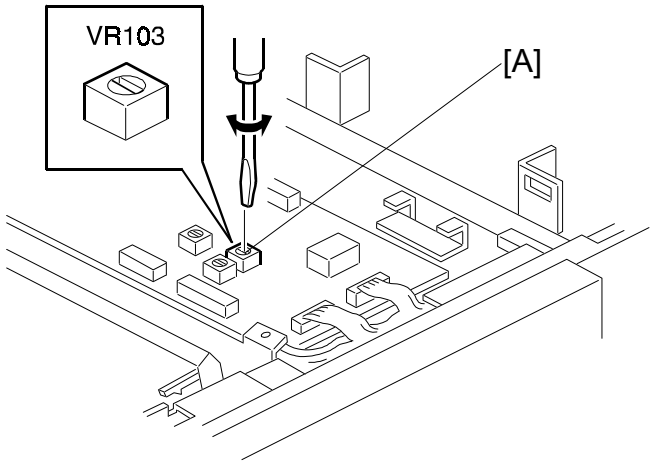
6.5.4 MASTER END SENSOR ADJUSTMENT

PURPOSE: To ensure that the sensor detects the end mark (a solid black area) on the master roll.

ADJUSTMENT STANDARD:

Within 1.5 ± 0.1 volts (when detecting the solid black area)

Within 3.7 ± 0.1 volts (when detecting a new master roll)

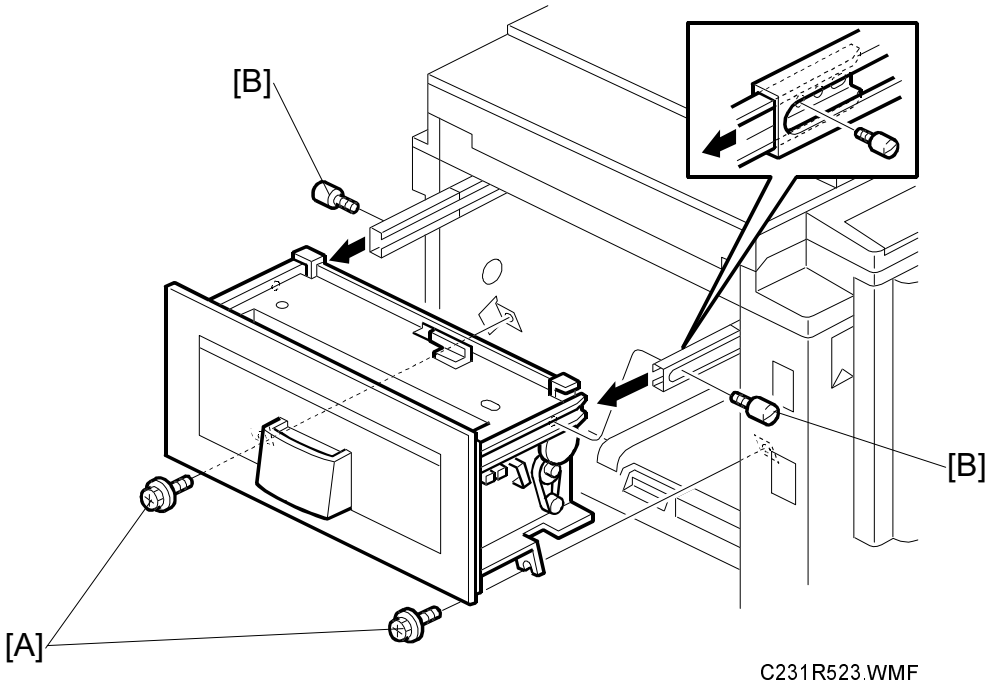


C231R559.WMF

1. Make a print that includes a solid fill black area.
2. Open the scanner unit, and remove the master roll.
3. Put the print so that the solid black image faces the master end sensor.
4. Turn on the main switch and access SP mode.
5. Select the master end sensor voltage mode (SP 135), then press the Enter key.
6. The sensor input voltage is displayed on the operation panel. (If it is 1.5 ± 0.1 volts, the following steps are not necessary.)
7. Open the scanner unit, and remove the MPU cover (2 screws).
8. Turn VR103 [A] so that the sensor input voltage becomes 1.5 ± 0.1 volts.
9. Remove the solid black pattern from the master end sensor.
10. Install a new master roll.
11. The sensor input voltage is displayed on the operation panel. Check that it is 3.7 ± 0.1 volts.

6.6 MASTER EJECT SECTION

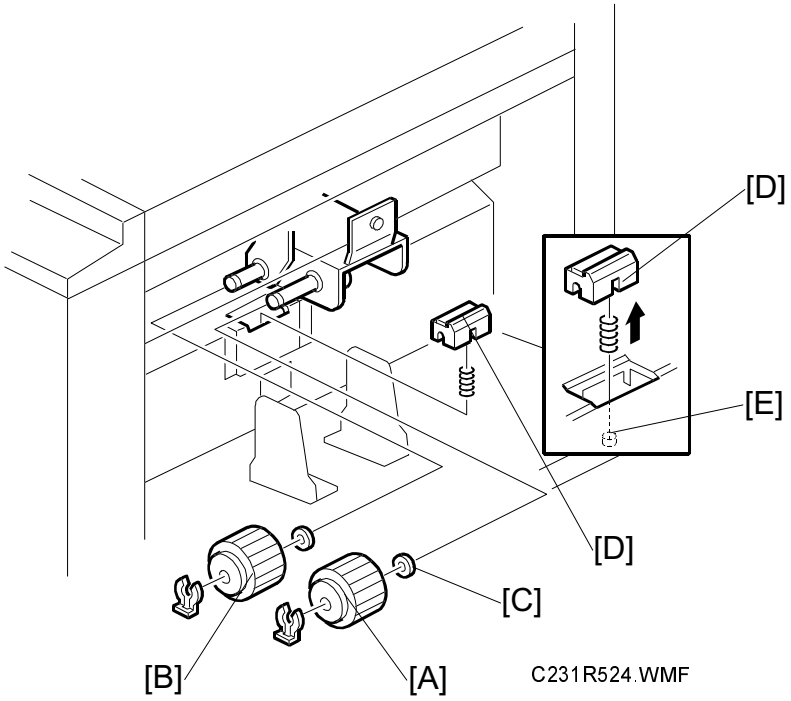
6.6.1 MASTER EJECT UNIT REMOVAL



1. Turn off the main switch and disconnect the power plug.
2. Remove the 2 screws [A].
3. Pull out the master eject unit.
4. Remove the 2 screws [B].

6.7 PAPER FEED SECTION

6.7.1 PAPER FEED ROLLER, PICK-UP ROLLER, AND FRICTION PAD



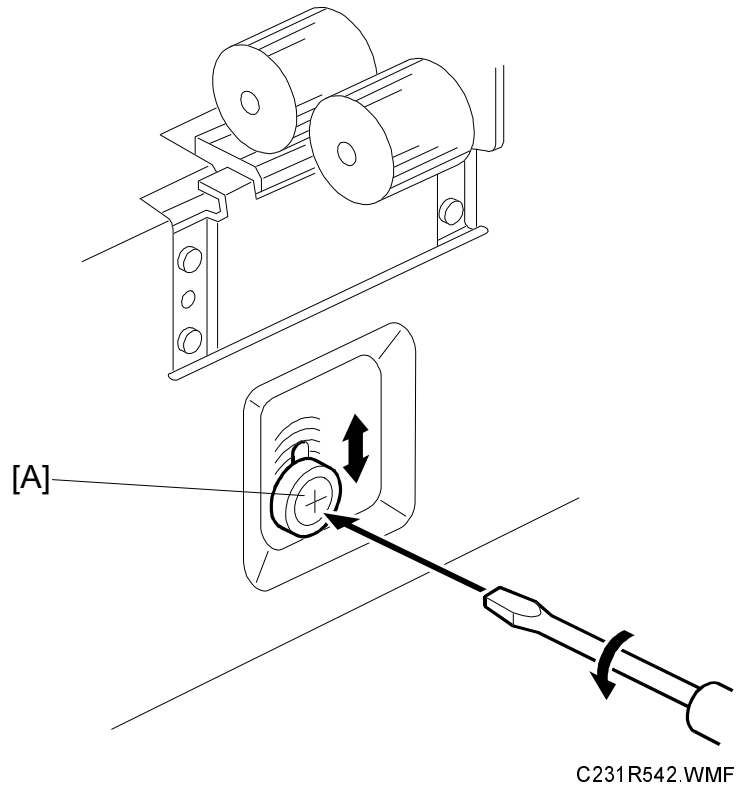
1. Turn off the main switch and disconnect the power plug.
2. Lower the paper table, and remove the pick-up roller [A] (1 snap ring).
3. Remove the paper feed roller [B] (1 snap ring).

   NOTE: 1) Do not lose the small spacers [C] inside the rollers.
   2) Install the paper feed roller in the proper way round, due to the one-way built-in clutch. The clutch faces inside.
4. Remove the friction pad base [D].

NOTE: Install the friction pad base in the proper way round, as shown. Also, be sure that the friction pressure spring is properly set into the hole in the friction pad base [D] and over projection [E] in the bottom hold. Otherwise, paper misfeed will occur.

6.7.2 PAPER SEPARATION PRESSURE ADJUSTMENT

PURPOSE: To ensure that the friction pad exerts sufficient pressure for smooth printing paper separation.



Adjust the paper separation pressure by loosening and moving up or down the adjusting screw [A].

- Moving up the screw ⇒ Increases the paper separation pressure
- Moving down the screw ⇒ Decreases the paper separation pressure

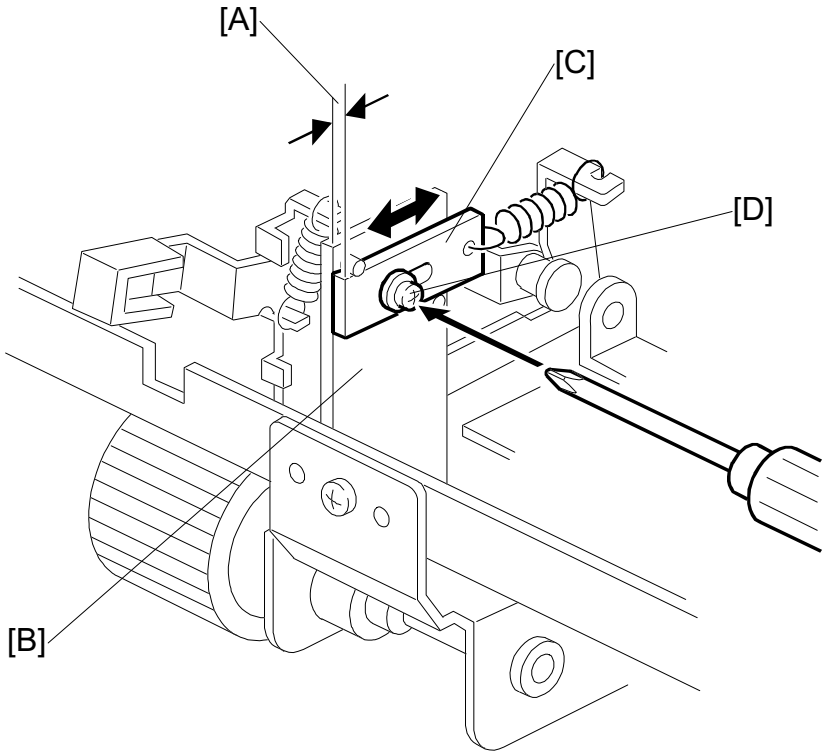
Tighten the screw after the adjustment.

NOTE: As the default, the screw is set at the lowest position.

6.7.3 PAPER FEED PRESSURE ADJUSTMENT

PURPOSE: To ensure that the paper feed roller exerts sufficient pressure for smooth printing paper feed.

ADJUSTMENT STANDARD:
0.0 to 0.3 mm



C231R543.WMF

NOTE: Users can adjust the paper feed pressure using the paper feed pressure lever. The adjustment method in this section is an additional adjustment for service technicians only.

1. Remove the paper table upper cover (7 screws), and check the gap [A] between the bracket [B] and spring anchor [C].

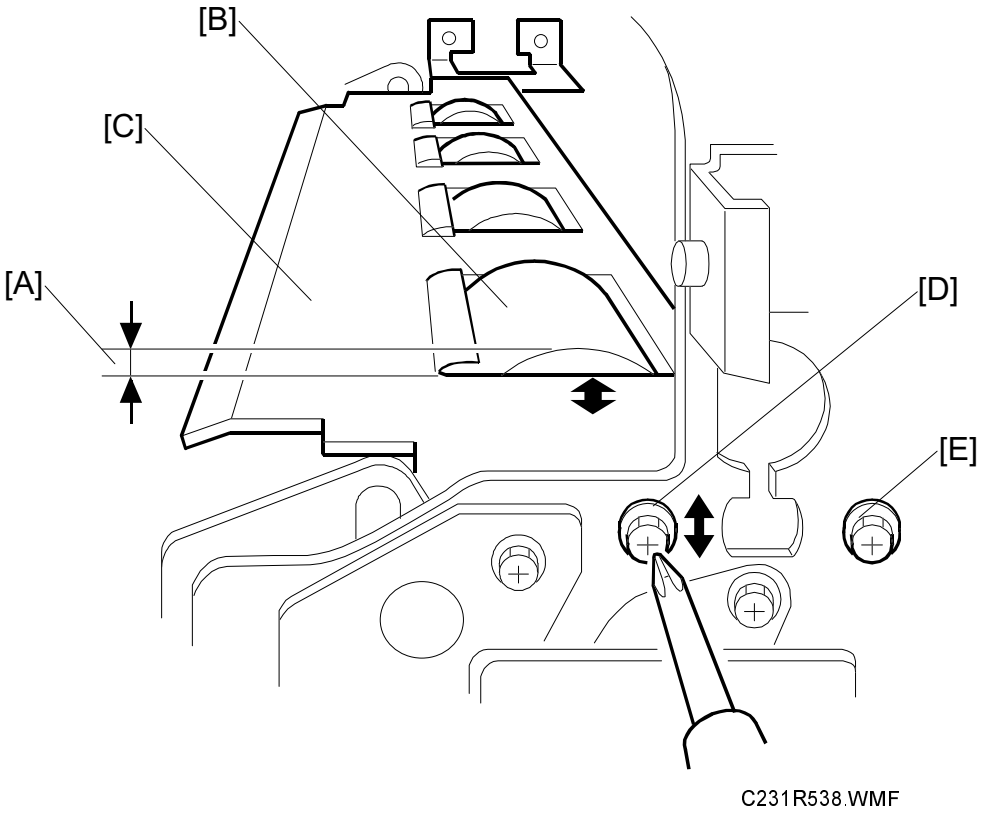
   NOTE: As the default, the gap [A] is less than 0.3 mm.

2. Adjust the paper feed pressure by moving up or down the spring anchor [C] (loose the screw [A]).
   - Moving it towards the front ⇒ Increases the feed pressure
   - Moving it towards the rear ⇒ Decreases the feed pressure

6.7.4 REGISTRATION ROLLER CLEARANCE ADJUSTMENT

PURPOSE: To ensure smooth paper feed with no paper jams, folds, or wrinkles.

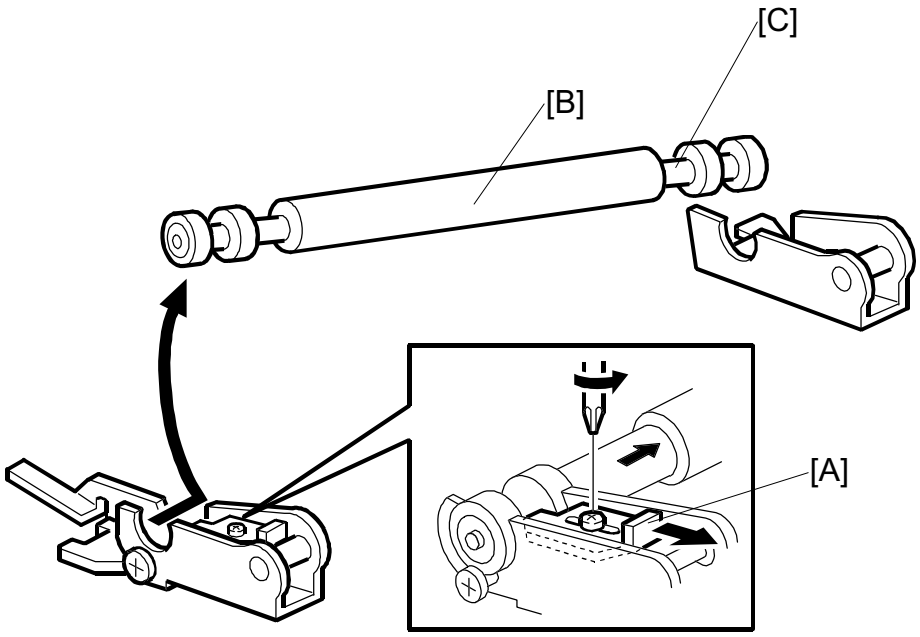
ADJUSTMENT STANDARD:
0.2 to 0.4 mm



1. Turn off the main switch and disconnect the power plug.
2. Remove the front cover. (See 6.1.5 Other Covers.)
3. Measure the clearance [A] between the lower registration roller [B] and the guide plate [C]. It should be 0.2 to 0.4 mm.
4. If it is not correct, adjust the position with the screw [D] after loosening the screw [D] and [E].
5. Repeat steps 3 and 4 for the rear side.

6.8 PRINTING SECTION

6.8.1 PRESS ROLLER REMOVAL



C231R526.WMF

⚠CAUTION

Take care to avoid possible injury. If the printing pressure release arms disengage, the press roller will be pulled upwards suddenly.

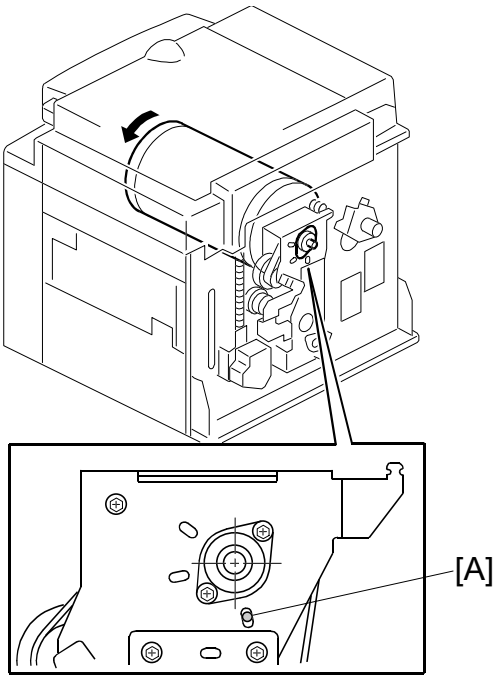
1. Turn off the main switch and disconnect the power plug.
2. Remove the drum unit.
3. Remove the front cover (4 screws). (See 6.1.5 Other Covers.)
4. Loosen the screw [A] (1 screw).
5. Remove the press roller [B].

CAUTION: The length of the shafts on the rear and front differs. During installation, ensure that the longer shaft [C] is positioned towards the rear of the machine.

6.8.2 PRESS ROLLER LOCK LEVER ADJUSTMENT

PURPOSE: To maintain the correct clearance between the press roller arms and press roller lock levers. This ensures that the press roller is correctly released and pressed against the drum when the press roller release solenoid is energized.

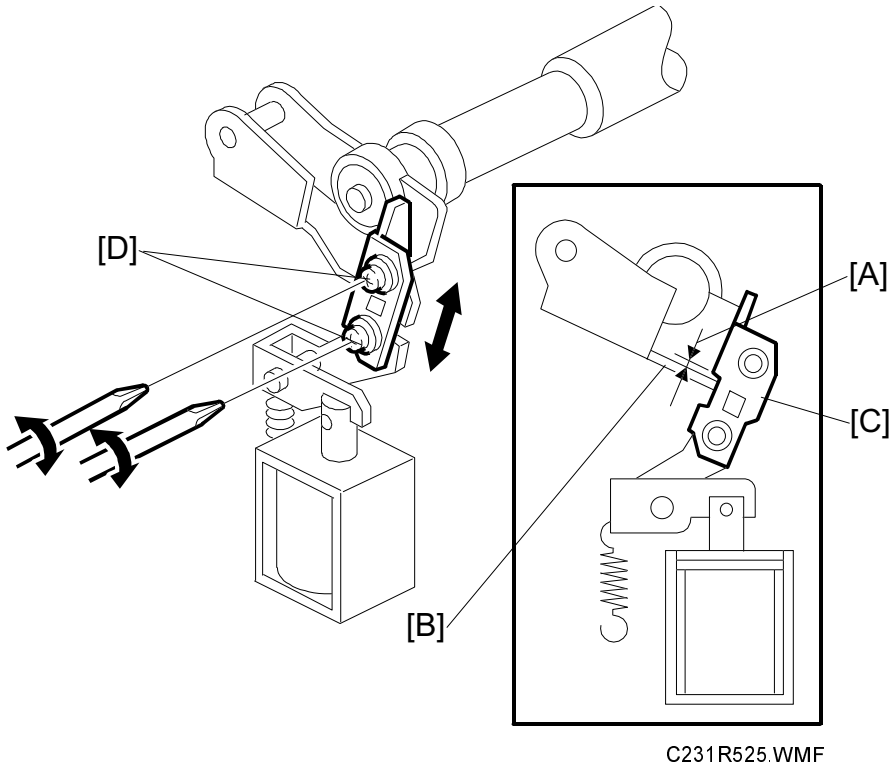
ADJUSTMENT STANDARD:
0.7 to 1.2 mm



C231R547.WMF

1. Turn off the main switch and disconnect the power plug.
2. Remove the drum unit and remove the front cover (4 screws).
   NOTE: The front cover must be removed prior to the adjustment.
3. Reinstall the drum.
4. Remove the rear cover (6 screws). (See 6.1.5 Other Covers.)
5. Turn the drum manually until the drum master clamper on the drum moves into the lowest position. (The high points of the cams on the drum flanges meet with the cam followers on both ends of the press roller.)

   NOTE: To find out the correct position of the drum for the adjustment, look at the rear end of the drum shaft. The recess on the drum drive gear meets the long hole [A] in the bracket when the drum is in the correct position.



C231R525.WMF

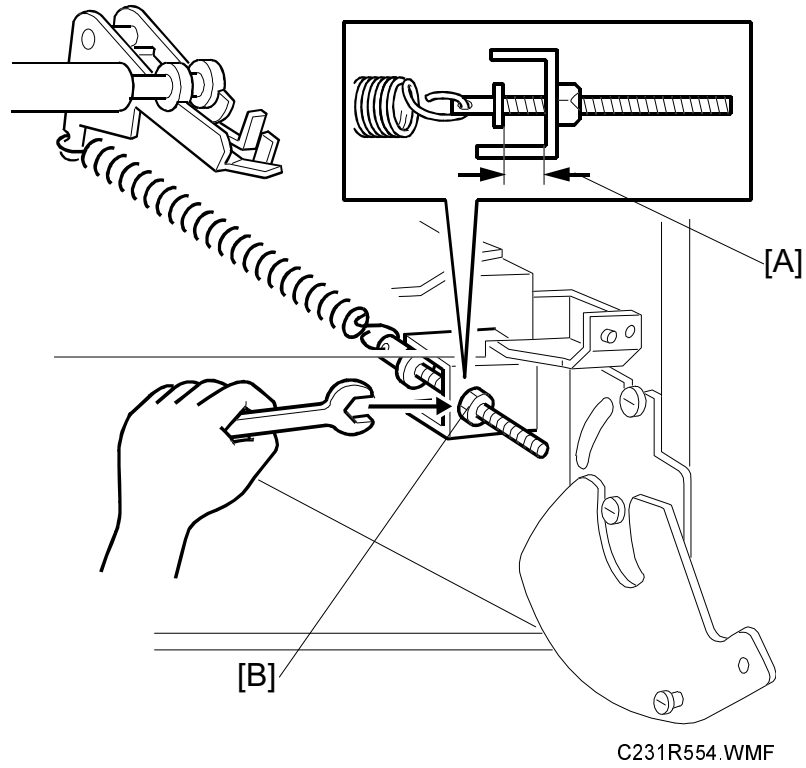
6. Using a thickness gauge, measure the clearance [A] between the press roller arm [B] and press roller lock lever [C] (rear side). It should be between 0.7 and 1.2 mm.
7. If it is not correct, adjust the position of the press roller lock lever after loosening the two screws [D].
8. Repeat steps 6 and 7 for the front side.

6.8.3 PRINTING PRESSURE ADJUSTMENT

PURPOSE: To make better print results without decreasing the run length.

ADJUSTMENT STANDARD:

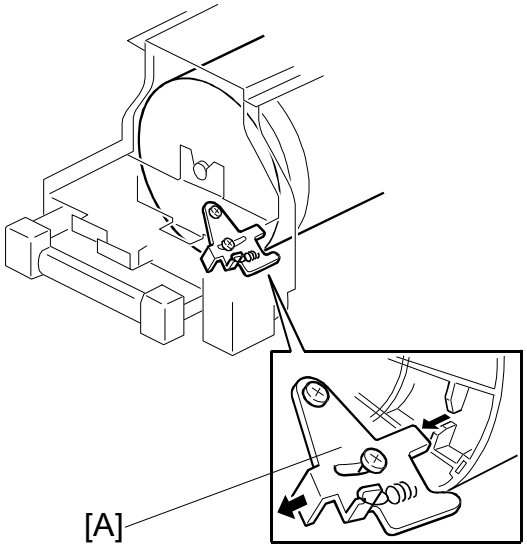
Within 10 ± 0.5 mm



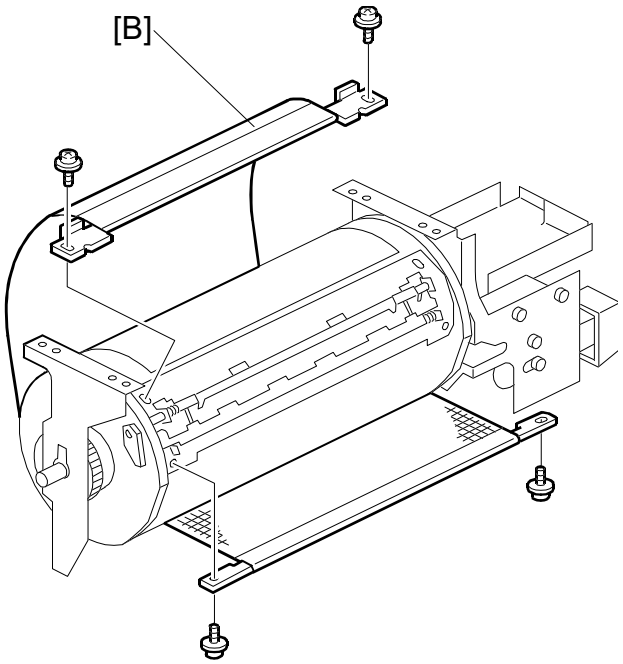
1. Turn off the main switch and disconnect the power plug.
2. Remove the paper delivery cover. (See 6.10.1 Vacuum Unit Removal.)
3. Adjust the distance [A] to 10 ± 0.5 mm by turning the adjusting bolt [B].
4. Repeat the same procedure for the printing pressure spring at the non-operation side.

6.9 DRUM AND DRIVE SECTION

6.9.1 DRUM CLOTH SCREEN REMOVAL



C231R557.WMF

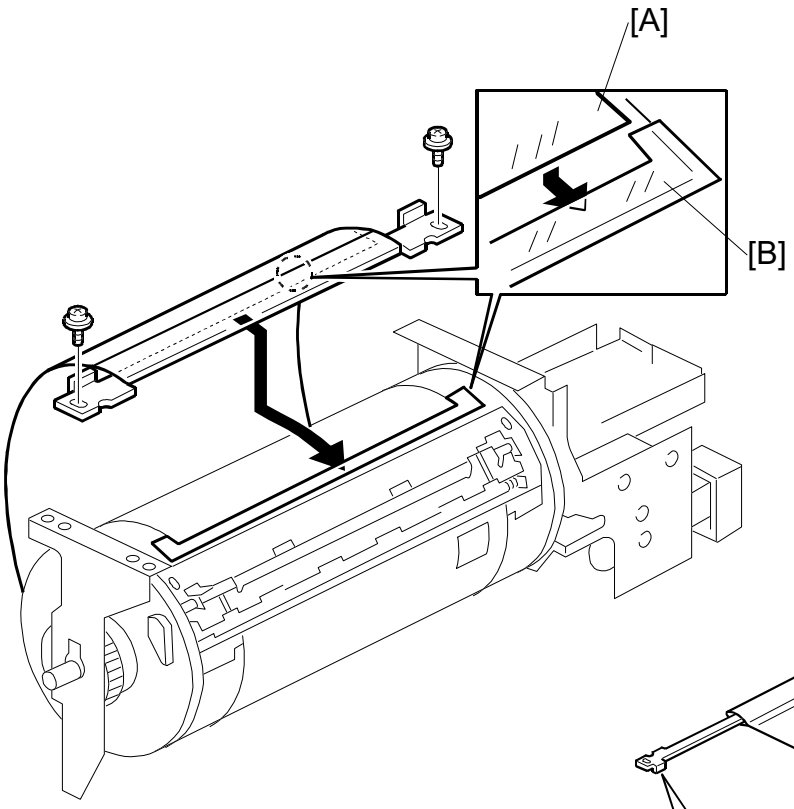


C231R530.WMF

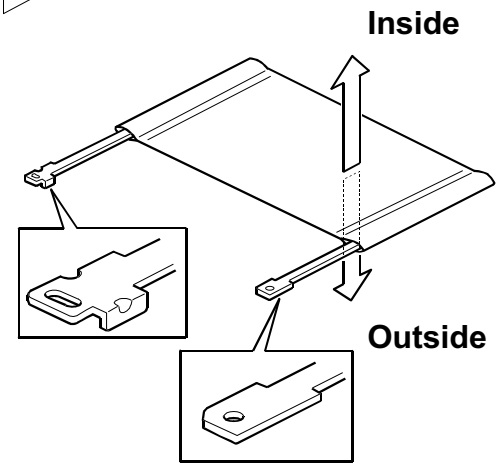
NOTE: Do not settle the drum unit upside down. However, if you do settle it upside down, wipe off the ink around the ink roller beforehand (to do this, use SP 140, select OFF in ink detection mode, and feed paper until ink ends).

1. Turn off the main switch and disconnect the power plug.
2. Remove the drum unit.
3. Remove the drum upper bracket (4 screws).
4. Release the stopper [A], then rotate the drum until the master clamper faces top.
5. Remove the cloth screen [B] (4 screws).

Remarks for the cloth screen installation



C231R579.WMF

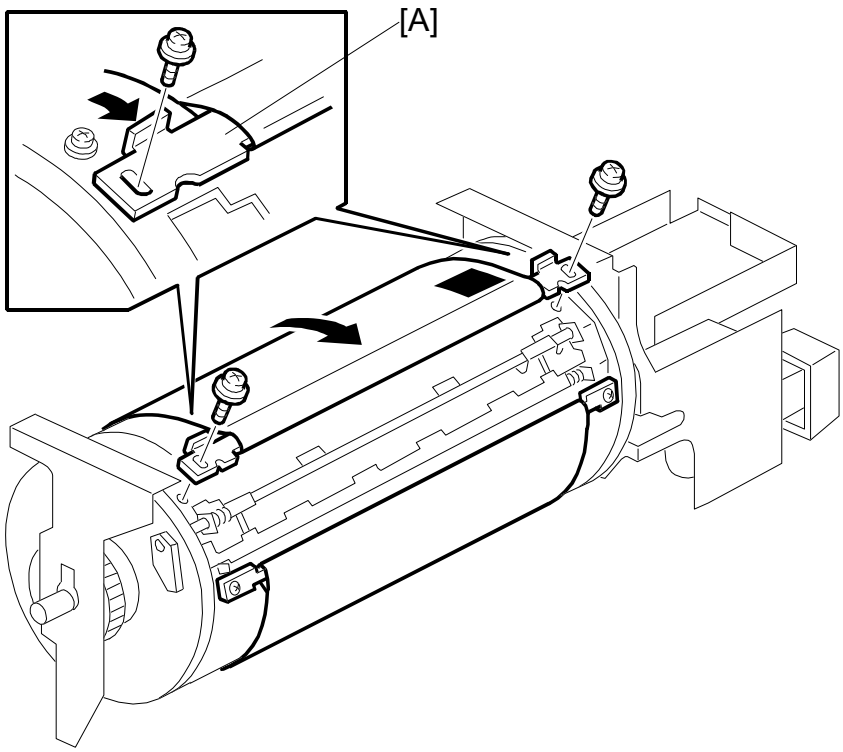


C231R558.WMF

- Do not scratch the cloth screen or metal screen.

- Properly insert the edge of the mylar [A] on the cloth screen under the mylar [B] on the metal screen, as shown above.
  Otherwise, ink will leak from the trailing edge of the master on the drum during a long printing run.

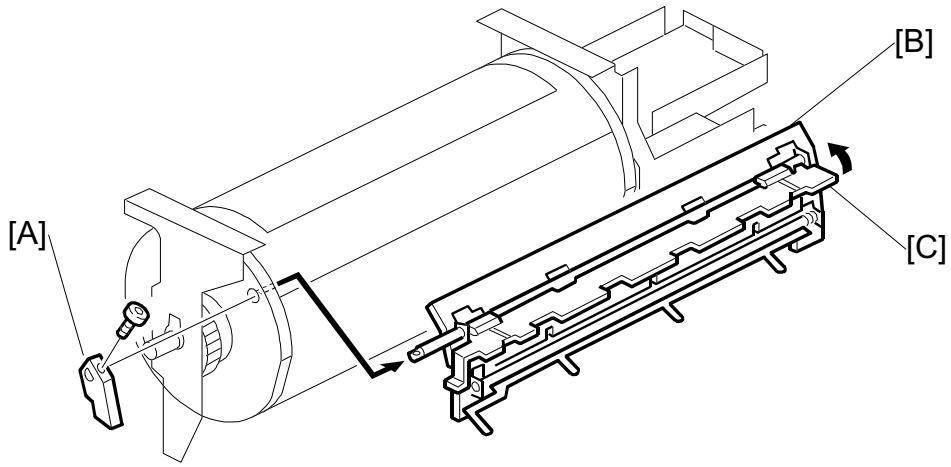
- Make sure that the correct side of the screen is facing up. In addition, make sure that the stays for securing the cloth screen are positioned correctly. (Refer to the lower right illustration.)



C231R556.WMF

- When replacing the cloth screen, spread the screen around the metal screen while strongly pulling the stay [A]. Adjust the stay so that it is parallel to the master clamper, then tighten the screws.
- Make sure that the cloth screen is not wrinkled while spreading it around the drum.

6.9.2 DRUM MASTER CLAMPER AND METAL SCREEN REMOVAL

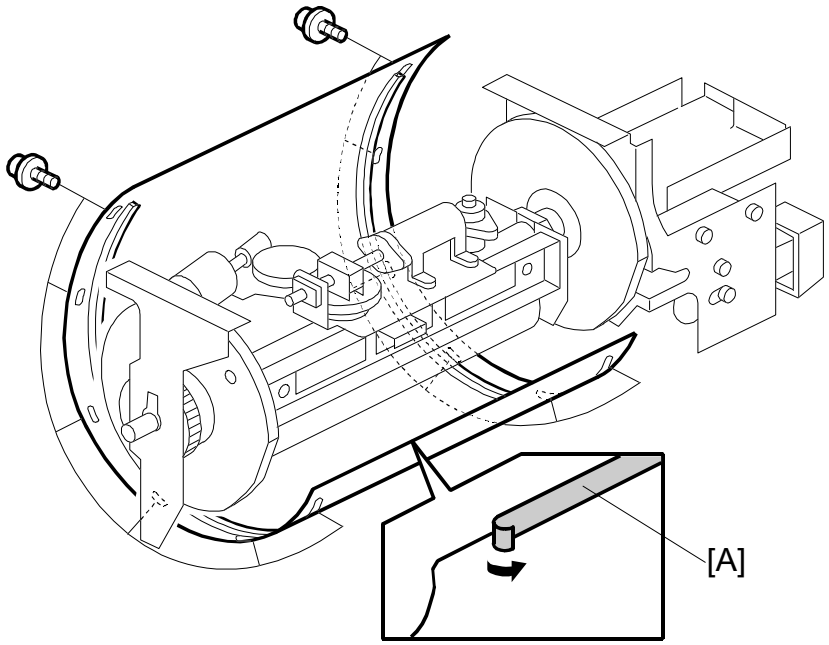


C231R573.WMF

NOTE: Do not settle the drum unit upside down. However, if you do settle it upside down, wipe off the ink around the ink roller beforehand (to do this, use SP 140, select OFF in ink detection mode, and feed paper until ink ends).

1. Turn off the main switch and disconnect the power plug.
2. Remove the drum.
3. Remove the drum screen. (See 6.9.1 Drum Cloth Screen Removal.)
4. Remove the clamper open lever [A] (1 hexagon screw).
5. Remove the drum master clamper [B] while opening the clamping plate [C].

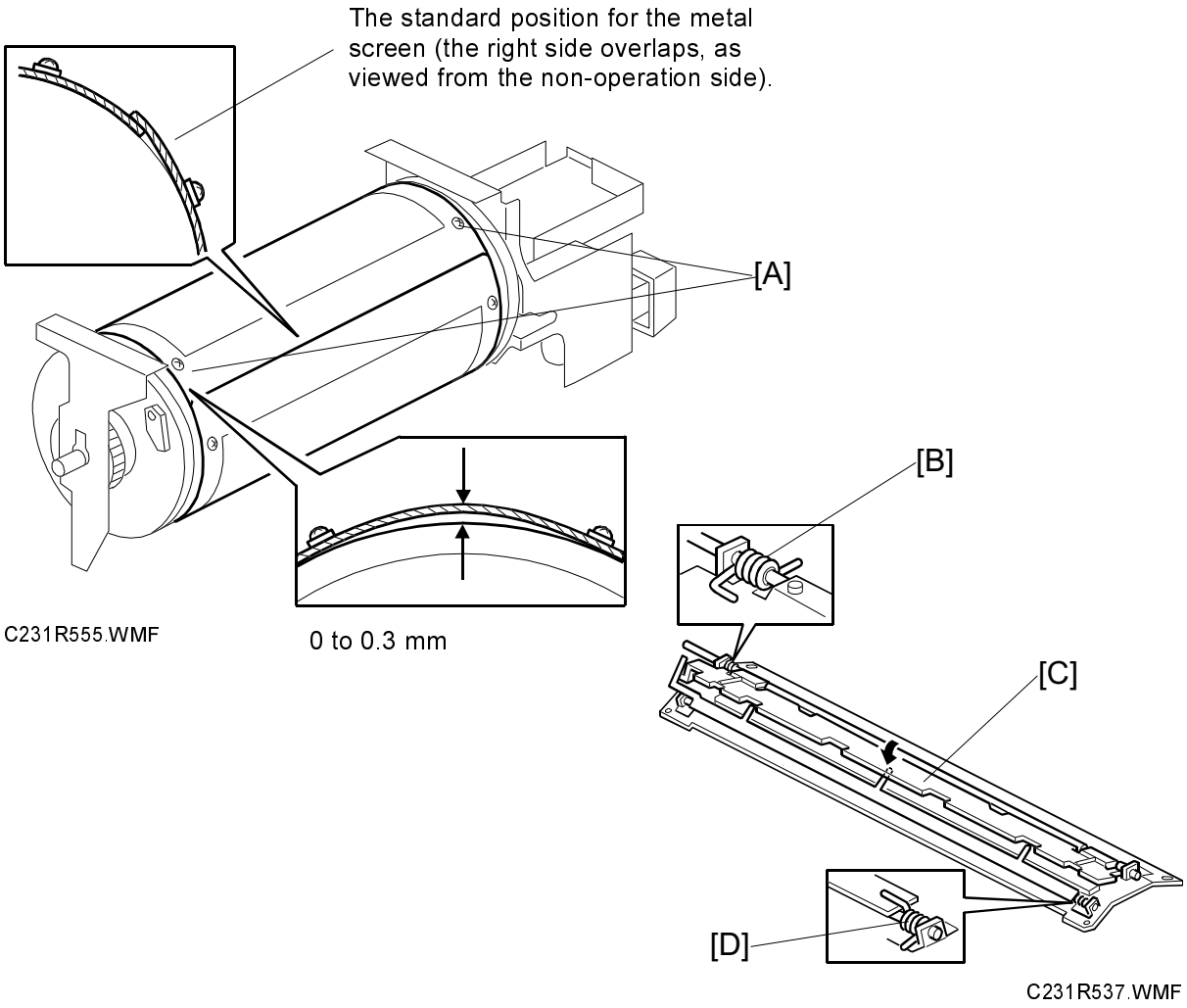
NOTE: 1) Do not allow the inside of the clamping plate [C] to become dirty with ink. If it is dirty with ink, the master may slip off and the image position on the prints will move toward the trailing edge of the print during a printing run.
2) Use a cloth dampened with water to clean the inside of the clamping plate [C]. Never use alcohol or other solvents. The clamping force of the magnet will be weakened.



C231R531.WMF

6. Peel off the tape [A].
7. Remove the metal screen (12 screws).

Remarks for drum screen installation



- Make sure that the correct end of the metal screen is overlapping. (Refer to the upper left illustration.)

- The 4 screws holding the drum master clamper are longer than the 12 screws holding the metal screen, although they are similar in appearance. Be careful not to mix them up or use the wrong screws.

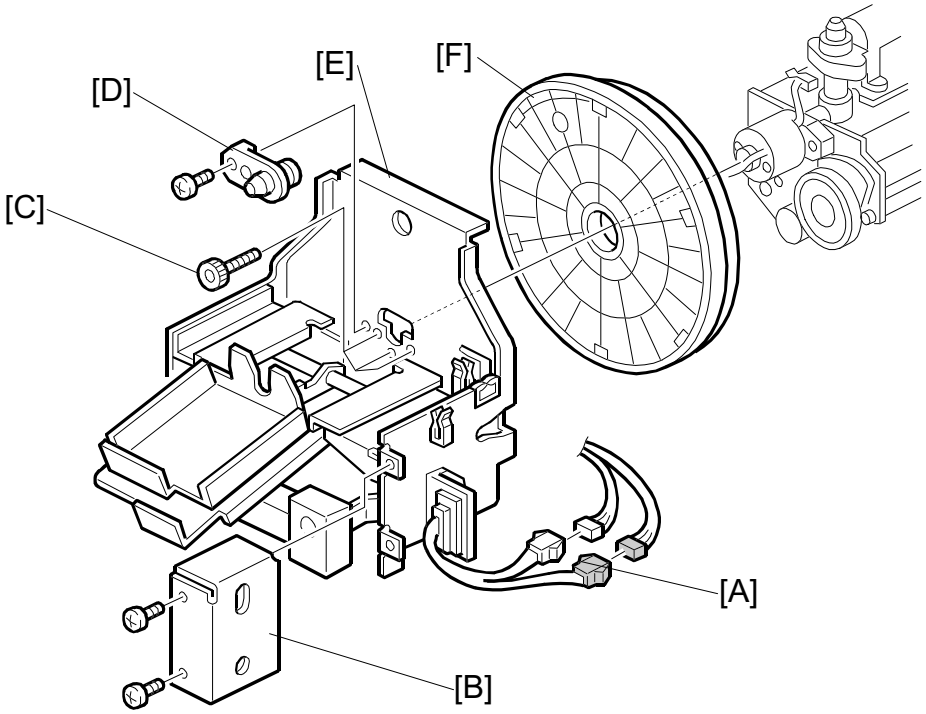
- When installing the metal screen, secure the trailing edge first with the 2 screws. Then, tighten the other screws while removing the slack from the screen. Make sure that the gap between the drum flanges and the screen is 0.3 mm or less, as shown in the upper illustration. (The two holes [A] on the trailing side are round holes and the other holes are long holes to allow for the removal of the slack.)

- Position the springs [B] and [D] (one each at the front and rear) as shown when reinstalling the drum master clamper [C].

- Do not scratch the cloth screen or metal screen.

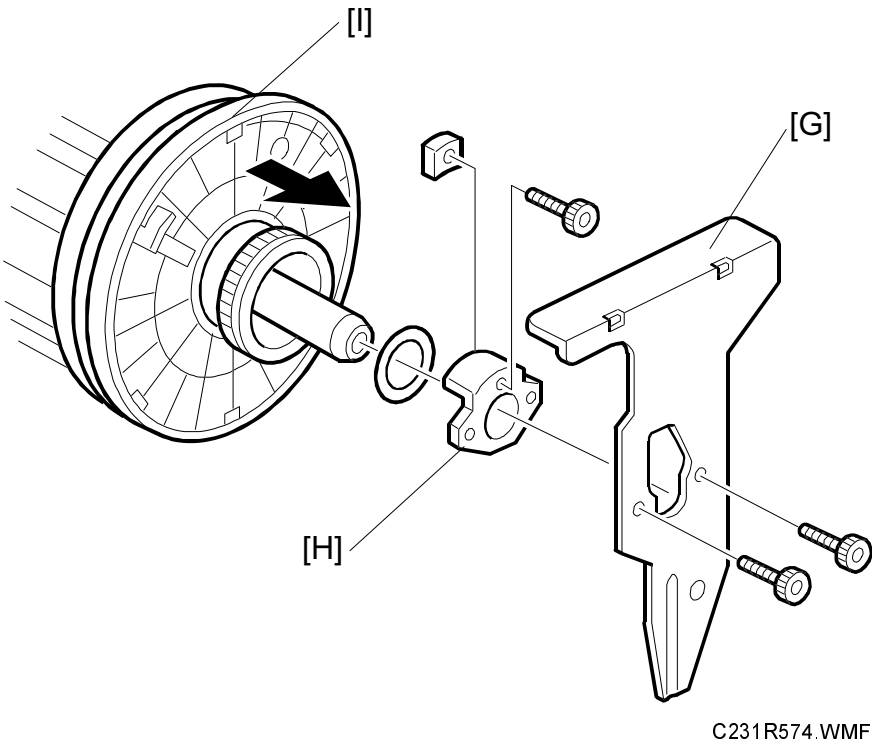
6.9.3 INK ROLLER UNIT REMOVAL

CAUTION: Never disassemble the ink roller unit. Each part between the front and rear side plates of this unit has been precisely adjusted on the production line to keep the doctor and ink rollers parallel against the drum shaft.



C231R578.WMF

1. Wipe off the ink around the ink roller beforehand (to do this, use SP 140, enter 0, and feed paper until ink ends).
2. Turn off the main switch and disconnect the power plug.
3. Remove the drum cloth and the metal screens. (See 6.9.1 Drum Cloth Screen Removal and 6.9.2 Drum Master Clamper and Metal Screen Removal.)
4. Disconnect the connectors [A] after removing the connector cover [B] (2 screws, 2 connectors).
5. Remove the ink socket [D] and the hexagon screws [C] after pulling out the ink cartridge (1 screw, 3 hexagon screws).
6. Remove the front drum bracket [E] and the front drum flange [F].



7. Remove the drum rear plate [G] (2 hexagon screws).
8. Remove the drum rear stopper [H] (1 hexagon screw).
9. Remove the drum rear flange [I].

NOTE: If the ink detection off mode has been selected with SP 140, do not forget to return it to the default (detection on).

6.9.4 DOCTOR ROLLER GAP ADJUSTMENT

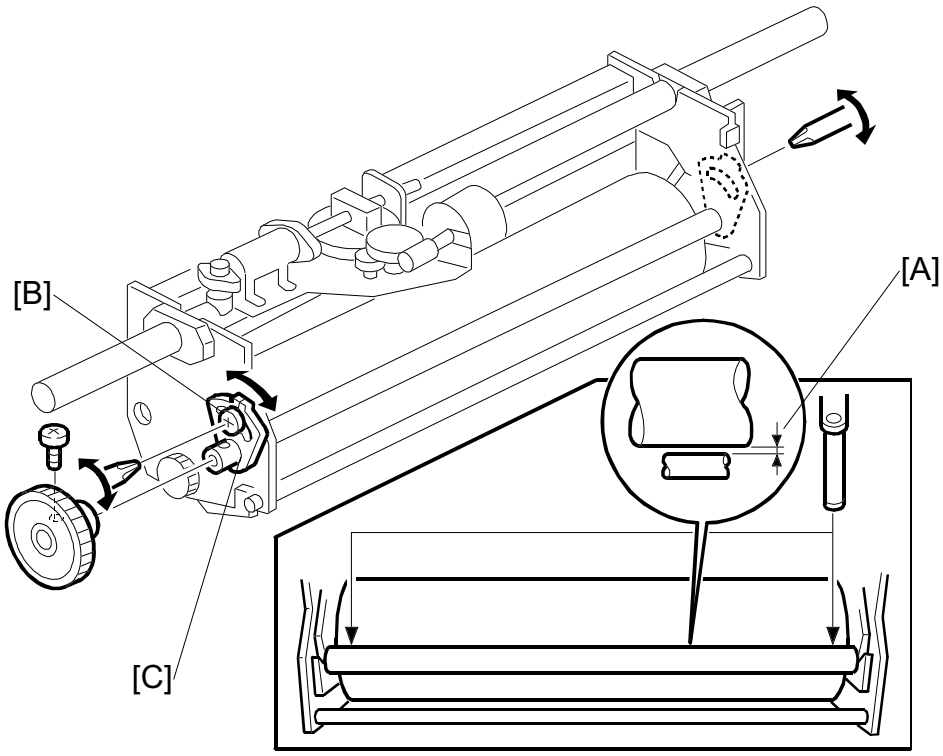
PURPOSE: To control the ink thickness around the ink roller.

ADJUSTMENT STANDARD:

0.07 mm gauge: Passes
0.09 mm gauge: Does not pass

CAUTION: Normally the doctor roller gap is not adjusted or changed. It tends to be difficult to change in the field. If the gap is too narrow, an uneven image may appear on the prints. If it is too wide, too much ink will be applied to the drum screens, resulting in ink leakage from the drum.

1. Wipe off the ink around the ink roller beforehand.
   NOTE: To make this procedure easier, use SP 140, select OFF in ink detection mode, and feed paper until ink ends.
2. Turn off the main switch and disconnect the power plug.
3. Remove the drum unit, then remove the ink roller unit. (See 6.9.3 Ink Roller Unit Removal.)
4. Wipe off the ink around the ink roller and doctor roller.



5. Make sure that a 0.07 mm gap gauge goes through the gap [A] between the ink and doctor rollers, and that a 0.09 mm gap gauge does not.

   NOTE: 1) The gap should be checked at both ends of the doctor roller. Insert a gap gauge at each end of the roller. The gap tends to be larger for the center.
   2) While the gap gauge is inserted, hold the doctor and ink rollers with your fingers in order to stop the rollers from rotating.
   3) While the gap gauge is inserted, hold the end of the gap gauge.

6. If the gap is out of the standard, loosen the screw [B] and adjust the gap by turning the cam bushing [C] for the front and for the rear.
   NOTE: Make sure to repeat the adjustment for both ends of the rollers.

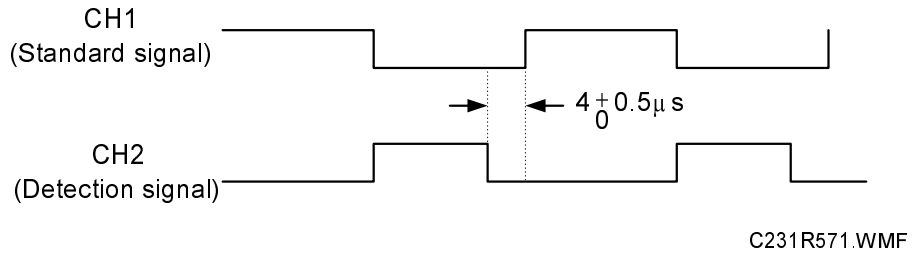
NOTE: If the ink detection off mode has been selected with SP 140, do not forget to return it to the default (detection on).

6.9.5 INK DETECTION ADJUSTMENT

PURPOSE: To ensure that the CPU detects a no ink condition.

ADJUSTMENT STANDARD:

See the following illustration.



CAUTION: This adjustment is required every time the MPU has been replaced.

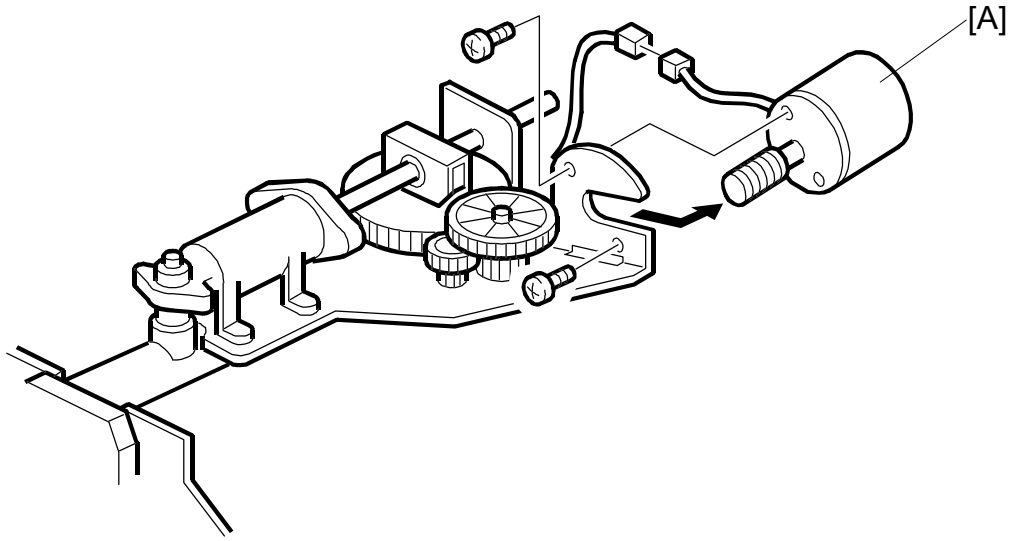
1. Wipe off the ink around the ink roller beforehand (using SP 140, enter 0, and feed paper until ink ends).
2. Turn off the main switch and disconnect the power plug.
3. Open the scanner.
4. Remove the MPU cover (2 screws).
5. Connect the CH1 probe of an oscilloscope to TP106, the CH2 probe to TP105, and the grounding leads of both probes to TP110 (-12 volts). Select the 5-microsecond range on the oscilloscope.
6. Connect the power plug and turn on the main switch.
7. Make sure that the waveform is as shown in the illustration while the ink end indicator lights.
8. If it is not correct, adjust the ON timing of the detection signal by turning VR101 beside the test pins.

NOTE: If the standard signal is delayed with respect to the detection signal, the machine cannot detect the no ink condition. In such a case, LED101 on the MPU lights to warn of this.

NOTE: If the ink detection off mode has been selected with SP 140, do not forget to return it to the default (detection on).

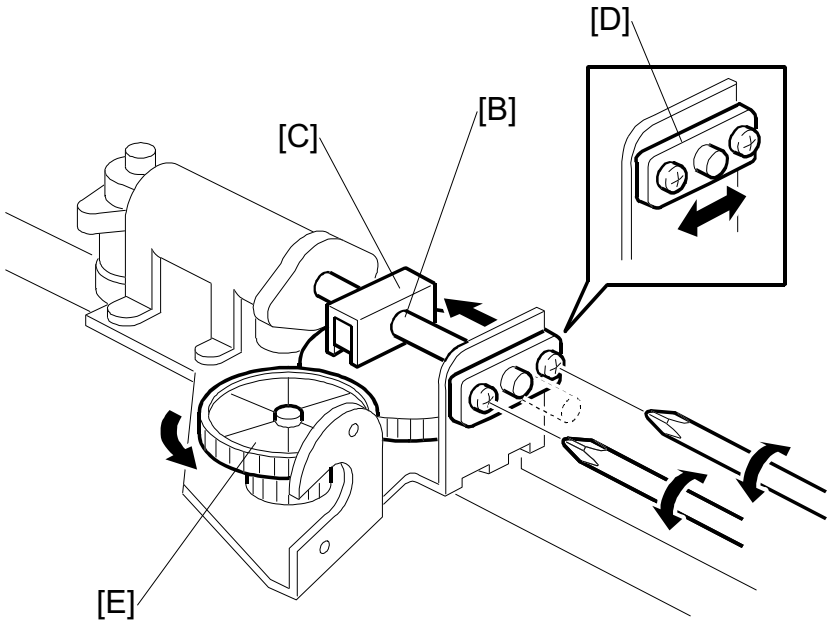
6.9.6 INK PUMP REMOVAL AND PLUNGER POSITION ADJUSTMENT

PURPOSE: To ensure the smooth operation of the ink pump plunger by properly positioning its holder.



C231R528.WMF

1. Turn off the main switch and disconnect the power plug.
2. Remove the drum unit.
3. Remove the drum screen. (See 6.9.2 Drum Master Clamper and Metal Screen Removal.)
4. Remove the ink supply motor [A] (2 screws).

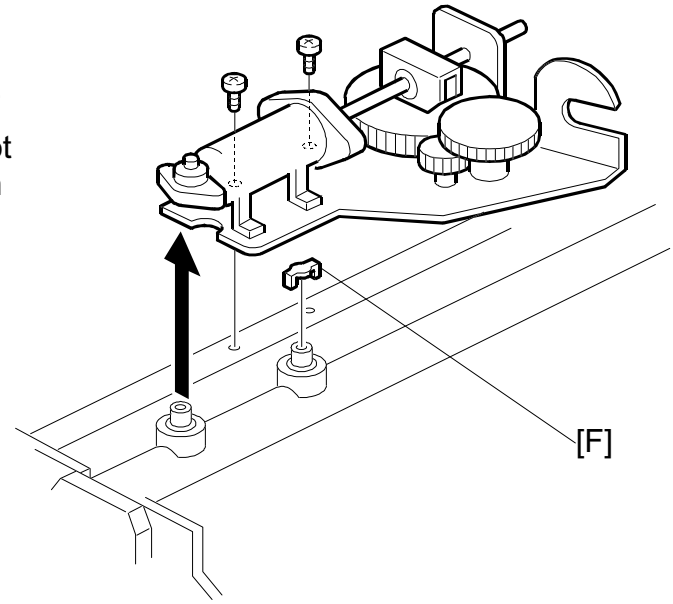


C231R536.WMF

5. Remove the E-ring [B] to free the plunger from the pump drive slider [C].
6. Loosen the two screws securing the plunger holder [D]. (Do not remove the holder.)
7. By turning the gear [E] manually, move the plunger until it reaches the bottom.
8. While holding the holder [D], re-tighten the two screws.
9. Reinstall the E-ring [B].

- Remark for the ink pump removal -

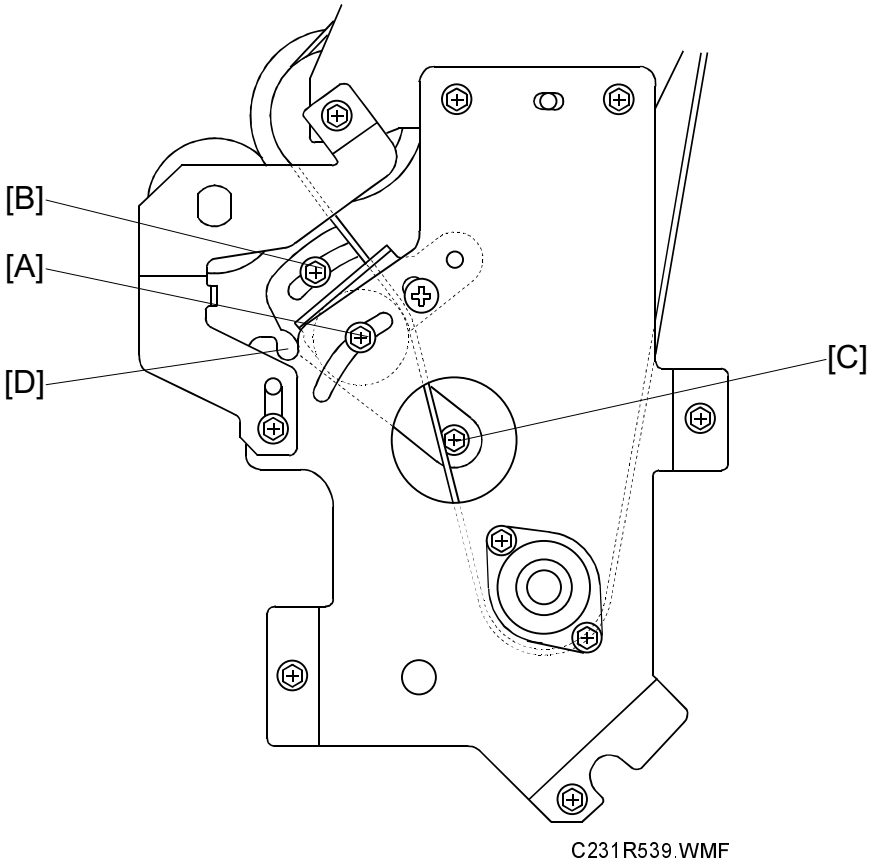
When removing the ink pump, do not lose the small metal valve [F]. When reinstalling the pump, first set the valve on the joint side as shown, then install the ink pump on the two joints.



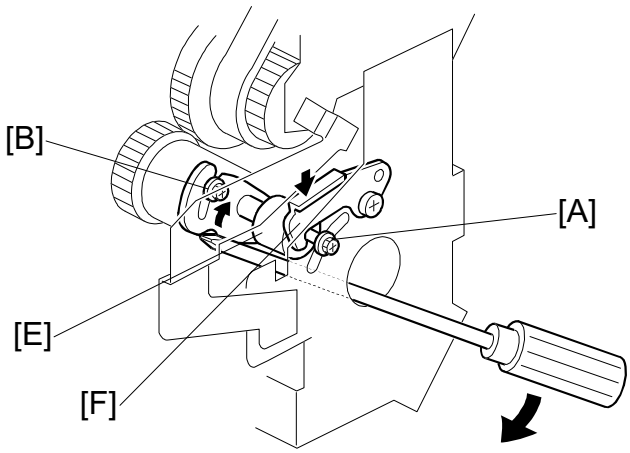
C231R580.WMF

6.9.7 MAIN DRIVE TIMING BELT TENSION ADJUSTMENT

PURPOSE: After the timing belt is replaced, correct belt tension must be applied using the procedure below.

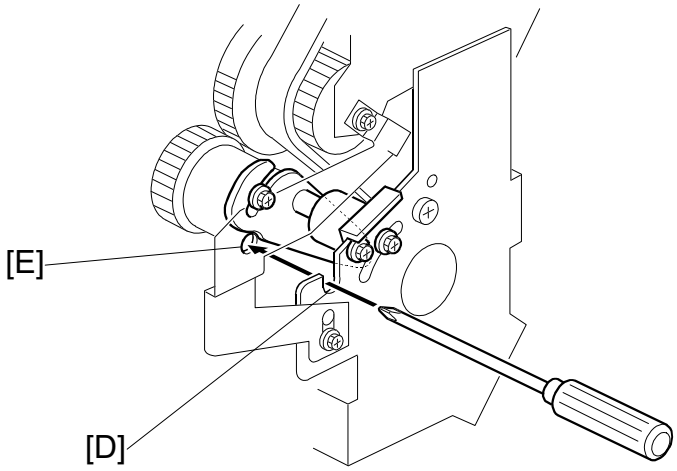


1. Turn off the main switch and disconnect the power plug.
2. Remove the rear cover (5 screws). (See 6.1.5 Other Covers.)
3. Loosen the screws [A], [B], and [C].



C231R540.WMF

4. Lift up the tension roller [E] with a screwdriver as shown.
5. Hook the stopper [F] onto the shaft [A].
6. Remove the screwdriver.

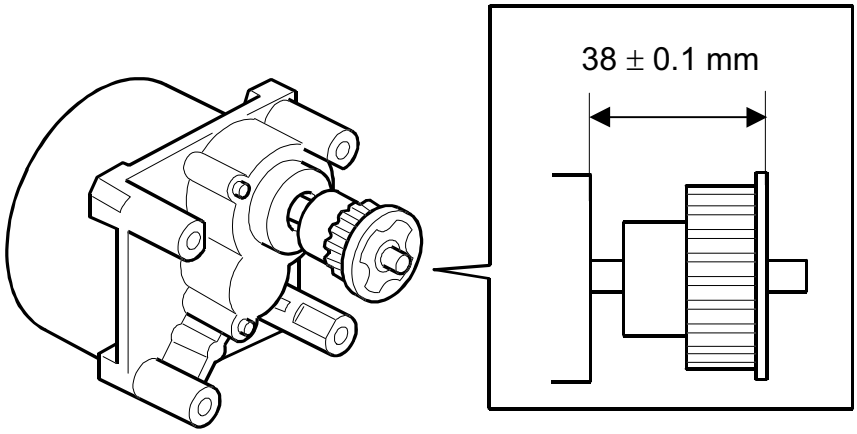


C231R541.WMF

7. Insert a screwdriver through spaces [D] and [E].

   NOTE: This is to set the shaft [A] in line.
8. Tighten the screws [A], [B], and [C], in that order.
9. Remove the screwdriver.

6.9.8 MAIN MOTOR PULLEY POSITION ADJUSTMENT

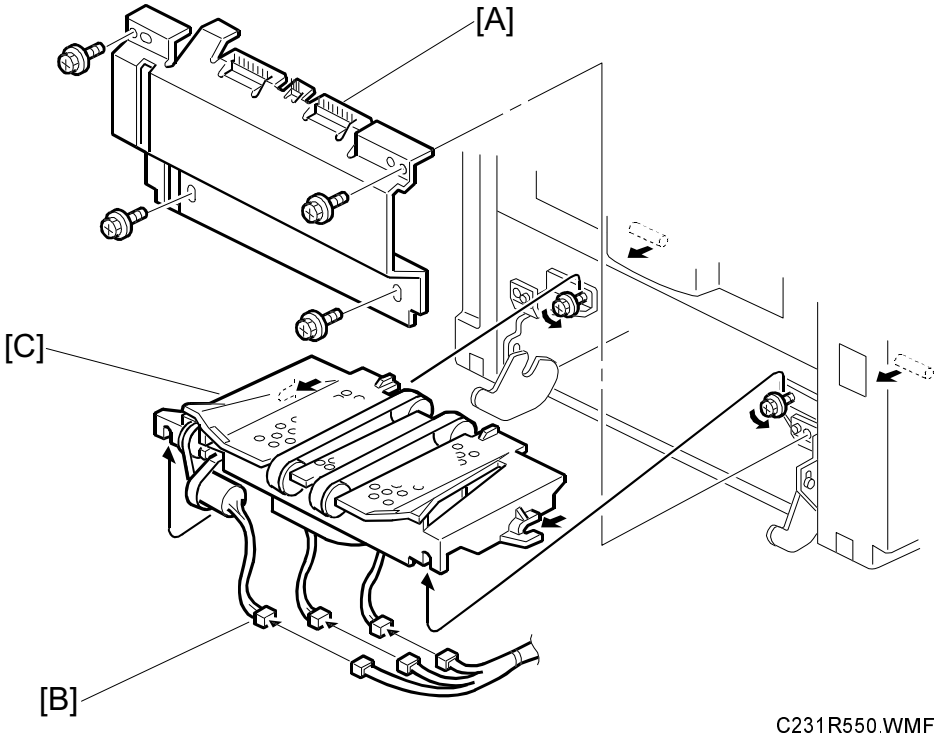


C231R546.WMF

After putting back the pulley onto the main motor shaft, refer to the above illustration for the correct position of the pulley.

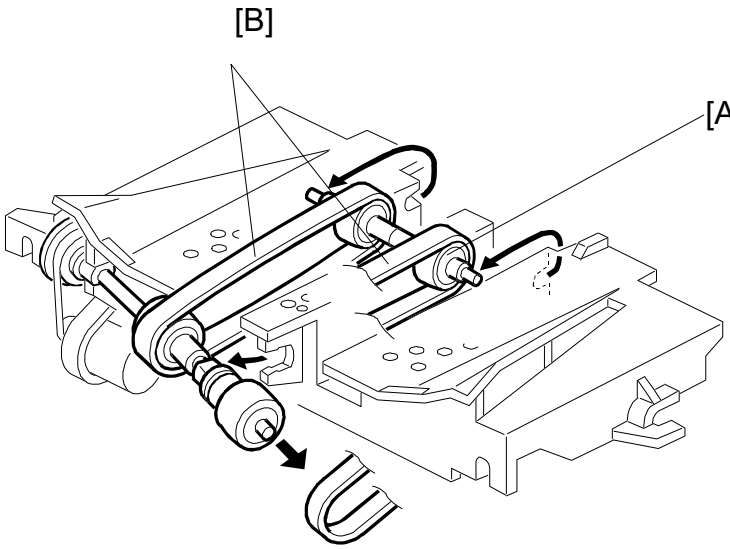
6.10 PAPER DELIVERY SECTION

6.10.1 VACUUM UNIT REMOVAL

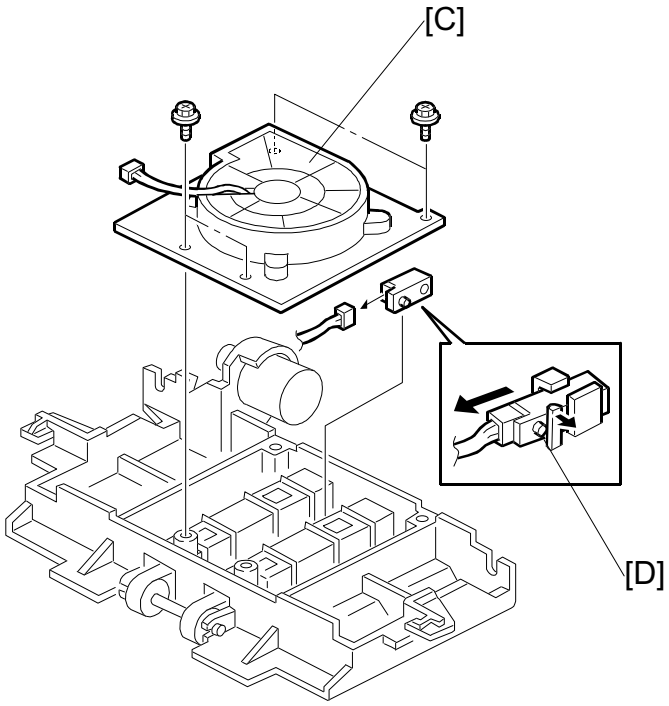


1. Turn off the main switch and disconnect the power plug.
2. Remove the paper exit table (2 screws).
3. Remove the paper delivery cover [A] (4 screws).
4. Disconnect the 3 connectors [B].
5. Remove the vacuum unit [C] (2 screws).

6.10.2 DELIVERY BELT/PAPER EXIT SENSOR REMOVAL



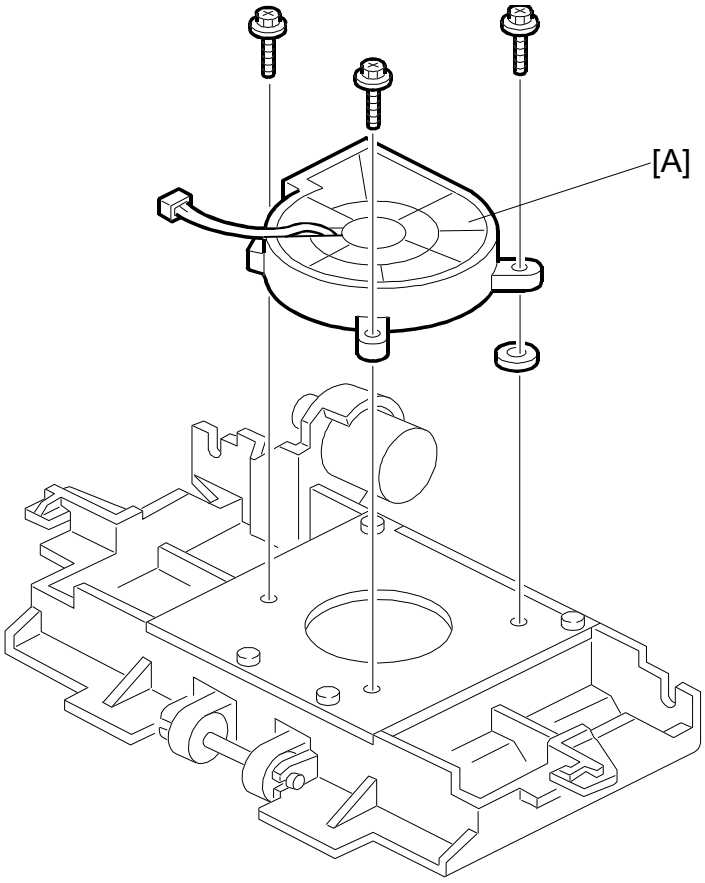
C231R551.WMF



C231R553.WMF

1. Turn off the main switch and disconnect the power plug.
2. Remove the vacuum unit. (See 6.10.1 Vacuum Unit Removal.)
3. Remove the belt tension roller [A].
4. Remove the delivery belts [B].
5. Remove the vacuum motor assembly [C] (3 screws).
6. Remove the paper exit sensor [D] (1 connector).

6.10.3 VACUUM MOTOR REMOVAL



C231R552.WMF

1. Turn off the main switch and disconnect the power plug.
2. Remove the vacuum unit. (See 6.10.1 Vacuum Unit Removal.)
3. Remove the vacuum motor [A] (3 screws).

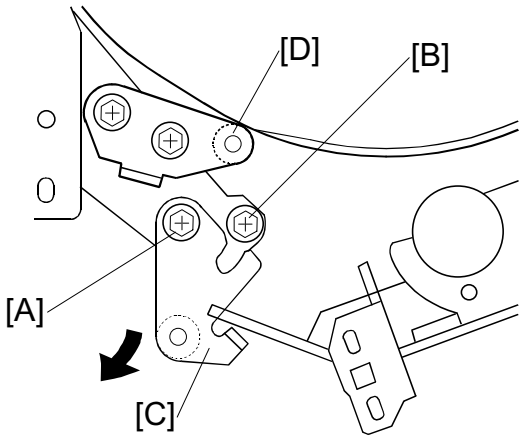
6.10.4 EXIT PAWL CLEARANCE ADJUSTMENT

PURPOSE: If the clearance is too narrow, the exit pawls may hit the drum screen and damage it. If it is too wide, paper may wrap around the drum.

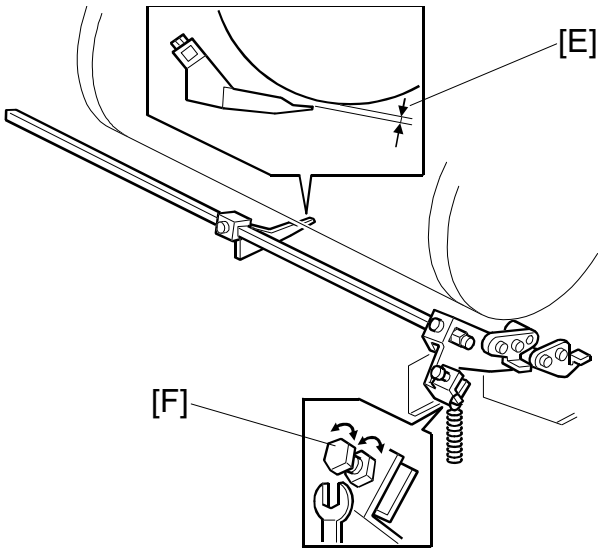
ADJUSTMENT STANDARD:

1.15 (± 0.15) mm

> **⚠CAUTION**
> **When this adjustment has been performed, check the exit pawl drive timing.**



C231R577.WMF



C231R544.WMF

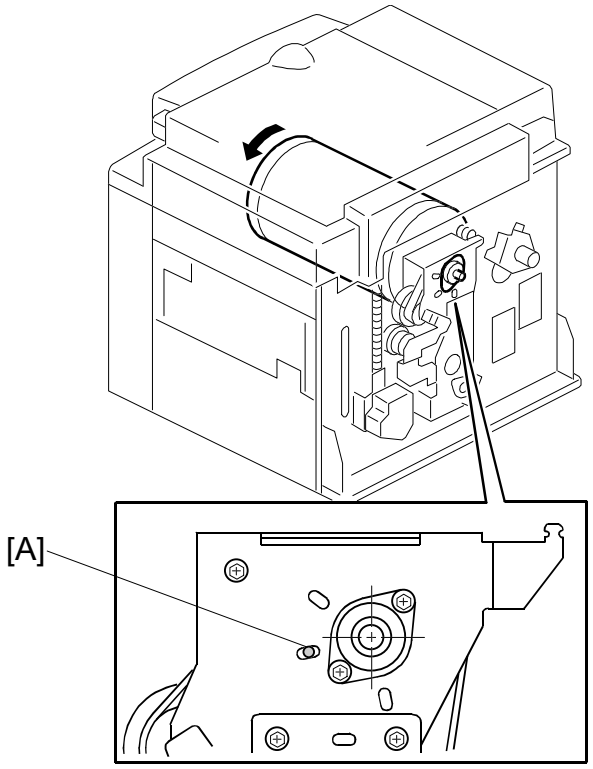
1. Turn off the main switch and disconnect the power plug.
2. Remove the drum, then remove the front cover (4 screws).
3. Reinstall the drum.
4. Loosen screw [A] then screw [B] in this order (do not remove them). Make sure that the bracket [C] becomes free from engagement and the cam follower [D] contacts the drum flange.
5. Using a gap gauge, measure the clearance [E] between the drum surface and the exit pawls. It should be between 1.0 and 1.3 mm.
6. If the clearance is not correct, loosen the lock nut. Then adjust the clearance by turning the bolt [F].
7. Reposition the bracket [C] and tighten the screws [A] and [B].

6.10.5 EXIT PAWL DRIVE TIMING ADJUSTMENT

PURPOSE: To ensure that the exit pawls can move out of the way of the drum master clamper while the drum is rotating.

ADJUSTMENT STANDARD:

0 to 0.5 mm

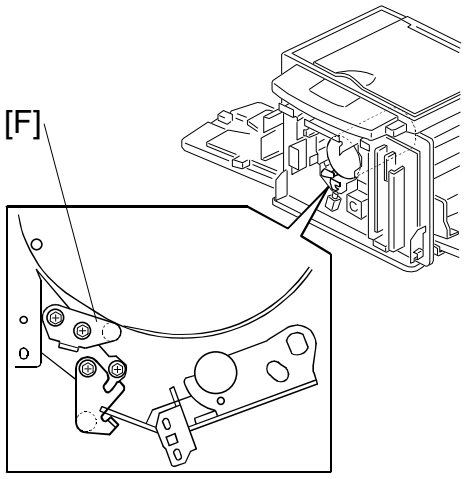


C231R548.WMF

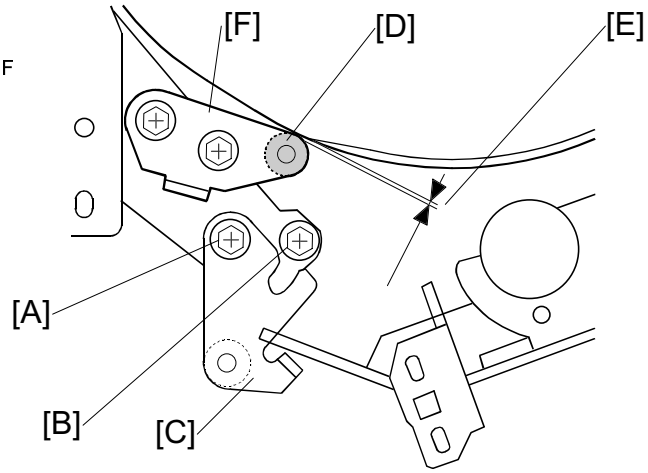
⚠CAUTION

Before this adjustment, the exit pawl clearance from the drum must be checked.

1. Turn off the main switch and disconnect the power plug.
2. Remove the front cover (4 screws) and the rear cover (6 screws).
3. Turn the drum manually until the recess in the drum drive gear meets the long positioning hole [A] in the bracket, as shown.



C231R575.WMF



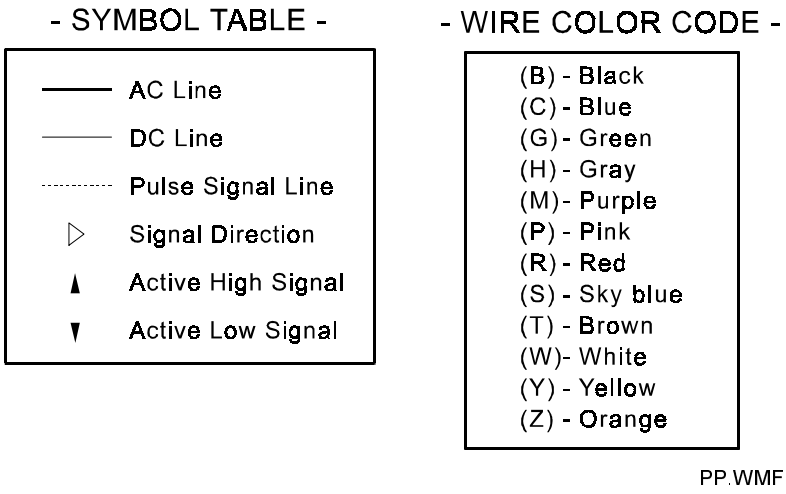
C231R576.WMF

4. Loosen screw [A] then screw [B] in this order (do not remove them). Make sure that the bracket [C] becomes free from engagement and the cam follower [D] contacts the drum flange.
5. Measure the gap [E] between the cam follower and cam face (front drum flange). It should be 0 to 0.5 mm.
6. If the gap is not correct, loosen the two screws securing the cam follower bracket [F].
7. Retighten the two screws while pushing the cam follower against the cam face. Make sure that the gap [E] is 0 or less than 0.5 mm.
   NOTE: Do not push the cam followers too strongly against the cam.
8. Reposition the bracket [C] and tighten the screws [A] and [B].

7. POINT TO POINT DIAGRAM

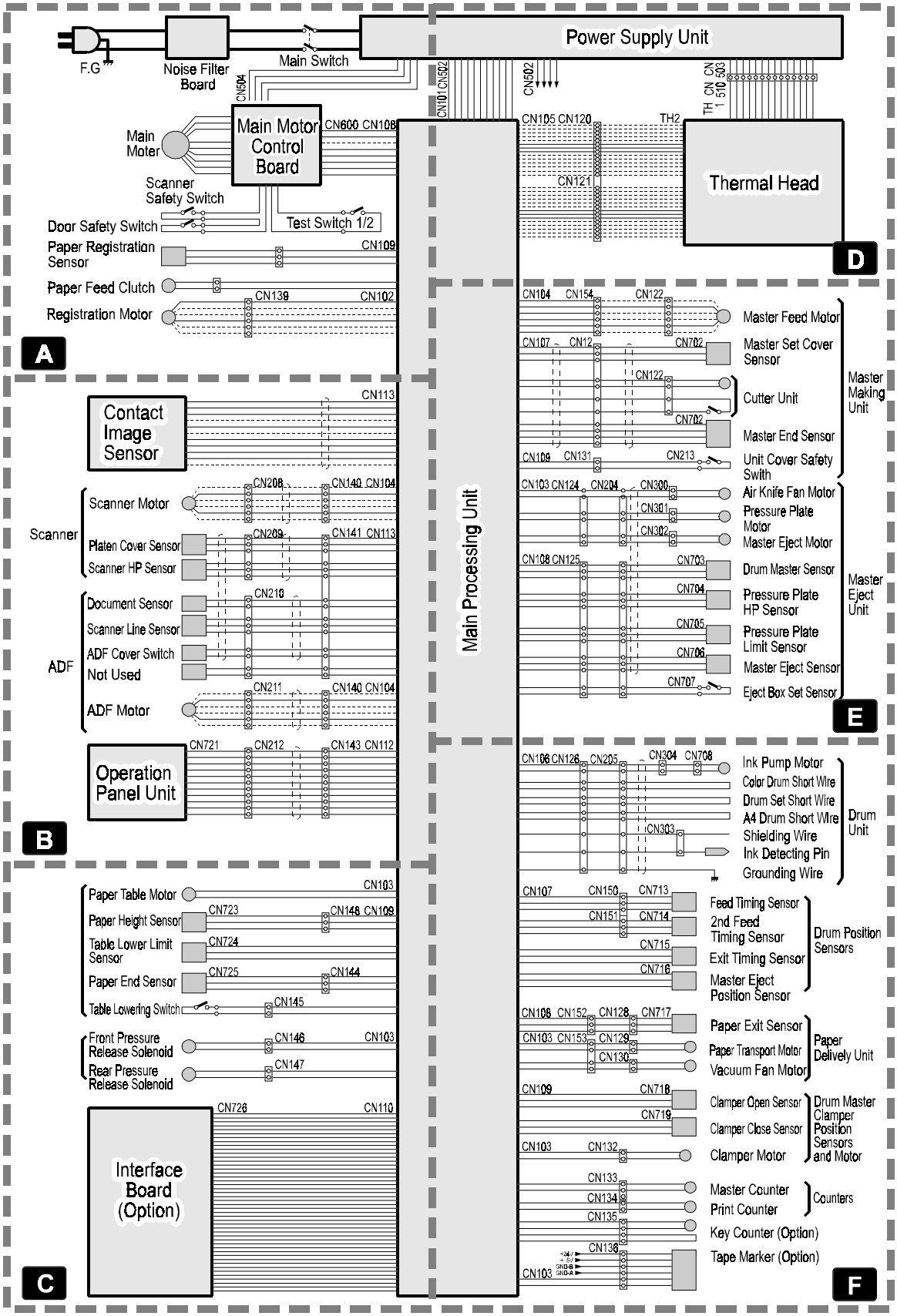
- Location Map
- Section A
- Section B
- Section C
- Section D
- Section E
- Section F

NOTE: The symbols and wire color codes used in the diagrams are as follows:



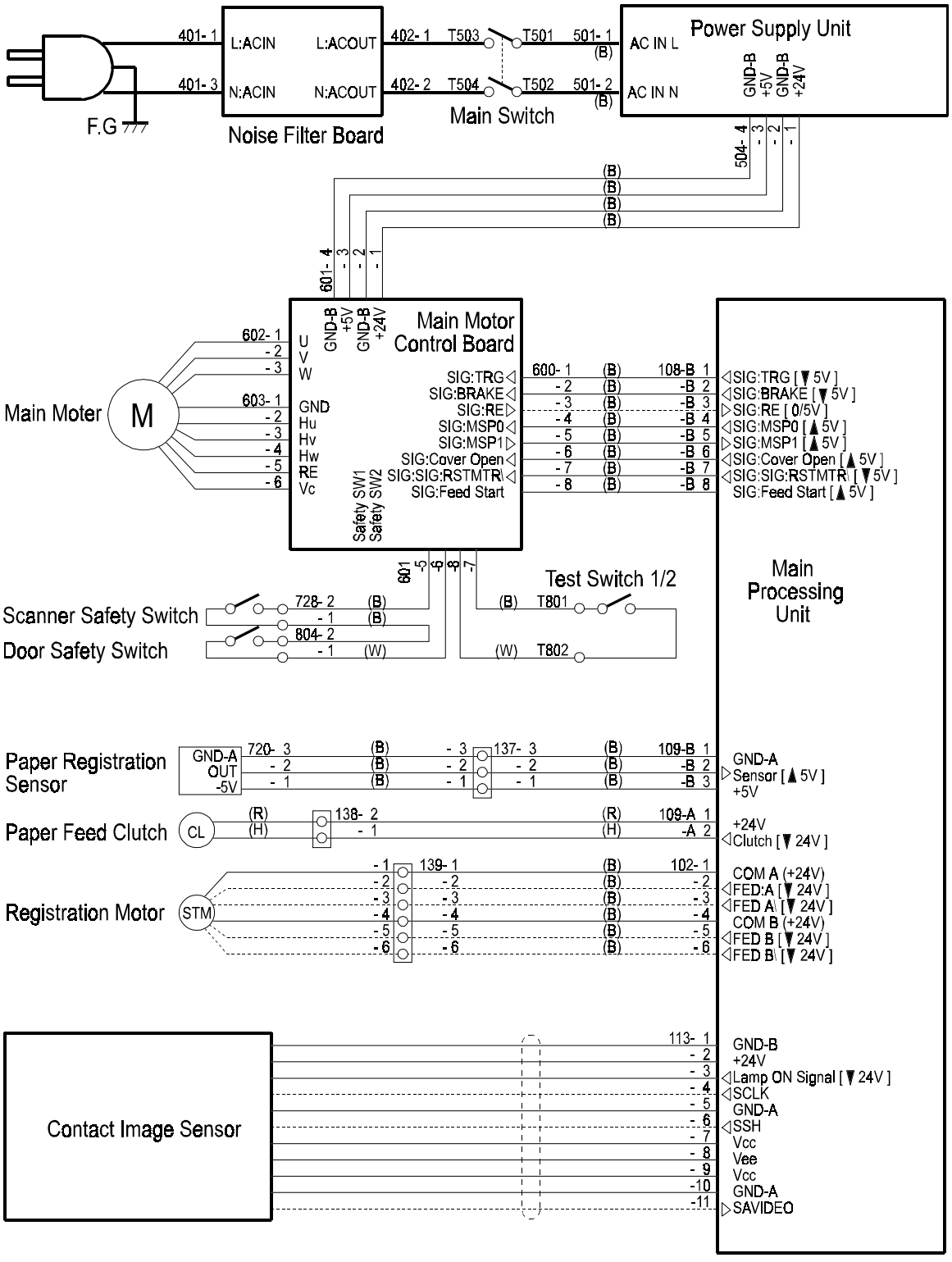
PP.WMF

Location Map

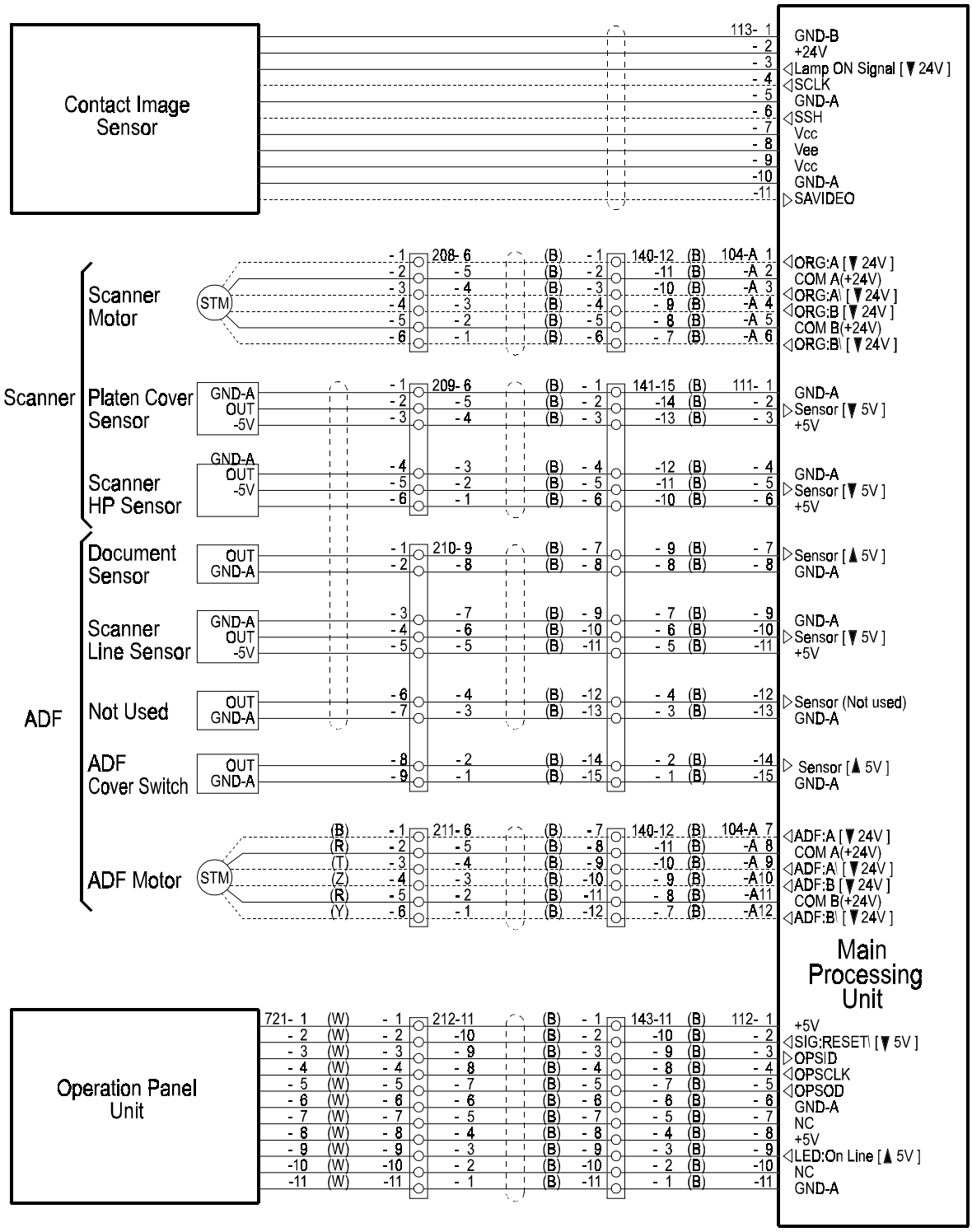


C231S500.WMF

Section A

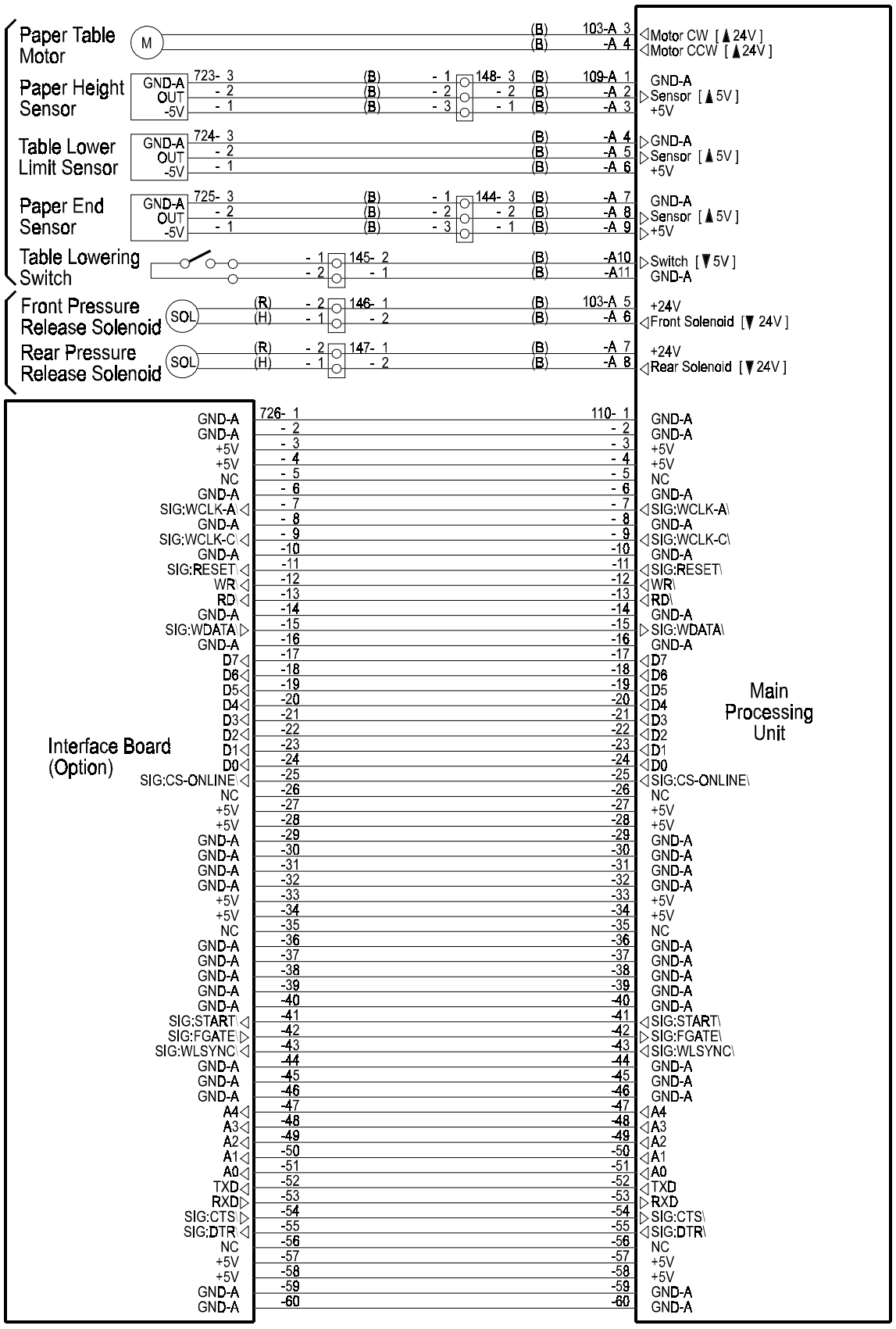

Power Supply Unit
AC IN L
AC IN N
GND-B
+5V
GND-B
+24V
Noise Filter Board
L:ACIN
L:ACOUT
N:ACIN
N:ACOUT
F.G
Main Switch
T503
T504
T501
T502
Main Motor Control Board
Main Moter
M
U
V
W
GND
Hu
Hv
Hw
RE
Vc
SIG:TRG
SIG:BRAKE
SIG:RE
SIG:MSP0
SIG:MSP1
SIG:Cover Open
SIG:SIG:RSTMTR\
SIG:Feed Start
Safety SW1
Safety SW2
Test Switch 1/2
T801
T802
Scanner Safety Switch
Door Safety Switch
Main Processing Unit
Paper Registration Sensor
GND-A
OUT
-5V
Paper Feed Clutch
CL
Registration Motor
STM
Contact Image Sensor
Lamp ON Signal [▼24V]
SCLK
SSH
Vcc
Vee
SAVIDEO
C231S501.WMF

Section B


Contact Image Sensor
113- 1 GND-B
- 2 +24V
- 3 ◁Lamp ON Signal [▼24V]
- 4 ◁SCLK
- 5 GND-A
- 6 ◁SSH
- 7 Vcc
- 8 Vee
- 9 Vcc
-10 GND-A
-11 ▷SAVIDEO
Scanner
Scanner Motor
STM
208- 6 (B) - 1 140-12 (B) 104-A 1 ◁ORG:A [▼24V]
- 5 (B) - 2 -11 (B) -A 2 COM A(+24V)
- 4 (B) - 3 -10 (B) -A 3 ◁ORG:A\ [▼24V]
- 3 (B) - 4 - 9 (B) -A 4 ◁ORG:B [▼24V]
- 2 (B) - 5 - 8 (B) -A 5 COM B(+24V)
- 1 (B) - 6 - 7 (B) -A 6 ◁ORG:B\ [▼24V]
Platen Cover Sensor
GND-A OUT -5V
209- 6 (B) - 1 141-15 (B) 111- 1 GND-A
- 5 (B) - 2 -14 (B) - 2 ▷Sensor [▼5V]
- 4 (B) - 3 -13 (B) - 3 +5V
Scanner HP Sensor
GND-A OUT -5V
- 3 (B) - 4 -12 (B) - 4 GND-A
- 2 (B) - 5 -11 (B) - 5 ▷Sensor [▼5V]
- 1 (B) - 6 -10 (B) - 6 +5V
ADF
Document Sensor
OUT GND-A
210- 9 (B) - 7 - 9 (B) - 7 ▷Sensor [▲5V]
- 8 (B) - 8 - 8 (B) - 8 GND-A
Scanner Line Sensor
GND-A OUT -5V
- 7 (B) - 9 - 7 (B) - 9 GND-A
- 6 (B) -10 - 6 (B) -10 ▷Sensor [▼5V]
- 5 (B) -11 - 5 (B) -11 +5V
Not Used
OUT GND-A
- 4 (B) -12 - 4 (B) -12 ▷Sensor (Not used)
- 3 (B) -13 - 3 (B) -13 GND-A
ADF Cover Switch
OUT GND-A
- 2 (B) -14 - 2 (B) -14 ▷Sensor [▲5V]
- 1 (B) -15 - 1 (B) -15 GND-A
ADF Motor
STM
(B) - 1 211- 6 (B) - 7 140-12 (B) 104-A 7 ◁ADF:A [▼24V]
(R) - 2 - 5 (B) - 8 -11 (B) -A 8 COM A(+24V)
(T) - 3 - 4 (B) - 9 -10 (B) -A 9 ◁ADF:A\ [▼24V]
(Z) - 4 - 3 (B) -10 - 9 (B) -A10 ◁ADF:B [▼24V]
(R) - 5 - 2 (B) -11 - 8 (B) -A11 COM B(+24V)
(Y) - 6 - 1 (B) -12 - 7 (B) -A12 ◁ADF:B\ [▼24V]
Main Processing Unit
Operation Panel Unit
721- 1 (W) - 1 212-11 (B) - 1 143-11 (B) 112- 1 +5V
- 2 (W) - 2 -10 (B) - 2 -10 (B) - 2 ◁SIG:RESET\ [▼5V]
- 3 (W) - 3 - 9 (B) - 3 - 9 (B) - 3 ▷OPSID
- 4 (W) - 4 - 8 (B) - 4 - 8 (B) - 4 ◁OPSCLK
- 5 (W) - 5 - 7 (B) - 5 - 7 (B) - 5 ◁OPSOD
- 6 (W) - 6 - 6 (B) - 6 - 6 (B) - 6 GND-A
- 7 (W) - 7 - 5 (B) - 7 - 5 (B) - 7 NC
- 8 (W) - 8 - 4 (B) - 8 - 4 (B) - 8 +5V
- 9 (W) - 9 - 3 (B) - 9 - 3 (B) - 9 ◁LED:On Line [▲5V]
-10 (W) -10 - 2 (B) -10 - 2 (B) -10 NC
-11 (W) -11 - 1 (B) -11 - 1 (B) -11 GND-A

C231S502.WMF

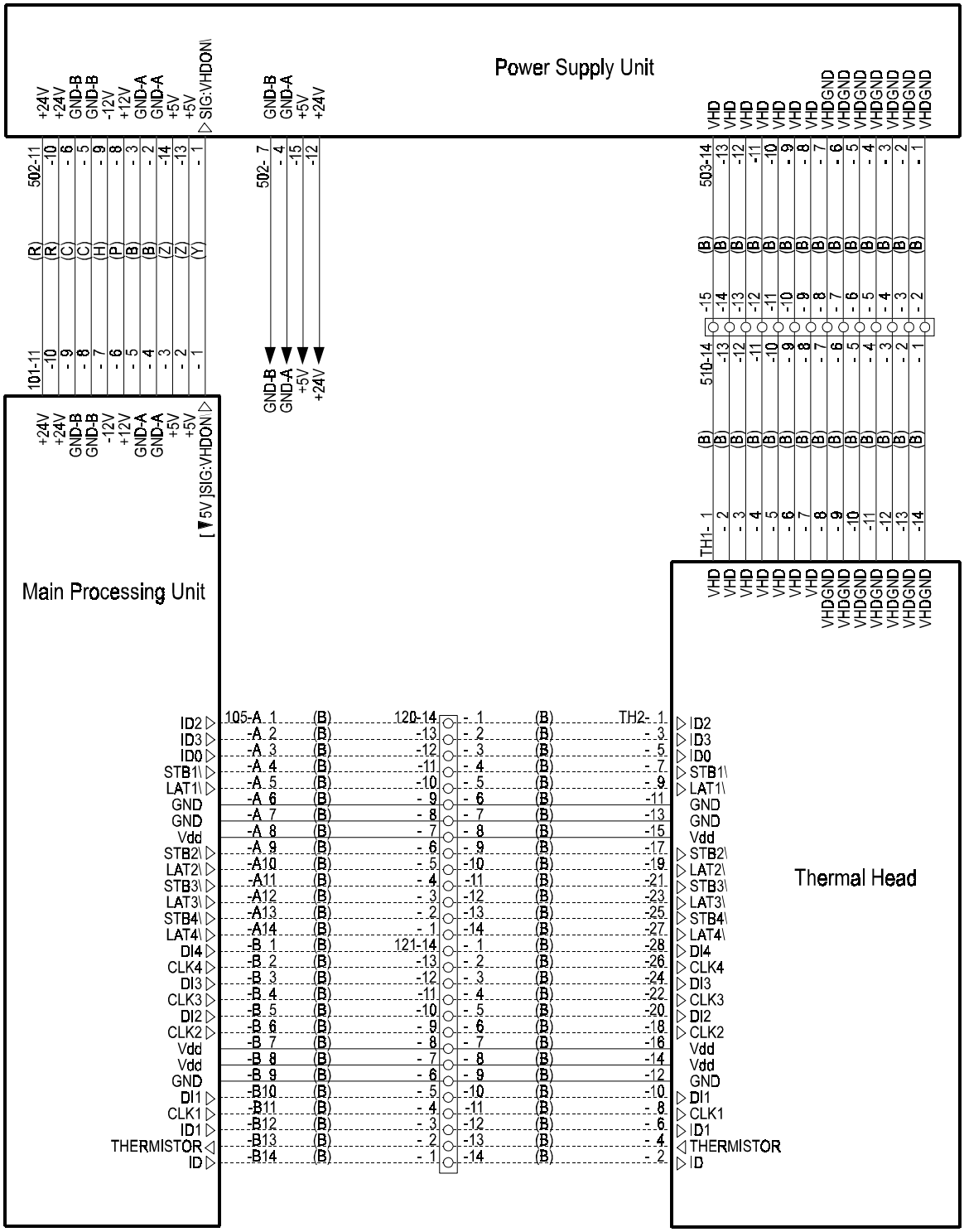
Section C



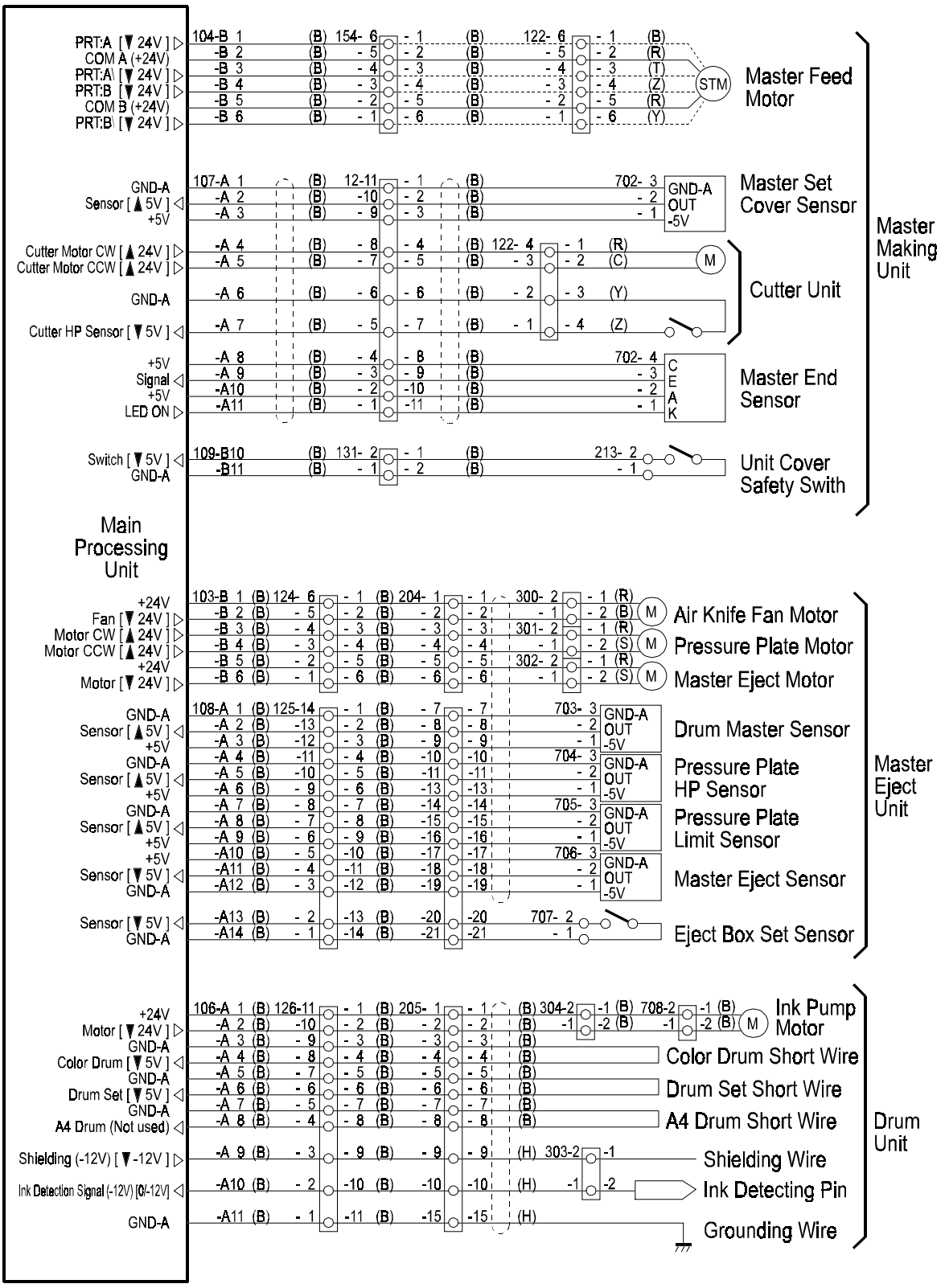
C231S503.WMF

P-to-P

Section D


Power Supply Unit
Main Processing Unit
Thermal Head
+24V
GND-B
GND-A
+5V
-12V
+12V
SIG:VHDON
VHD
VHDGND
THERMISTOR
ID2
ID3
ID0
STB1\
LAT1\
GND
Vdd
STB2\
LAT2\
STB3\
LAT3\
STB4\
LAT4\
DI4
CLK4
DI3
CLK3
DI2
CLK2
DI1
CLK1
ID1
ID
C231s504.WMF

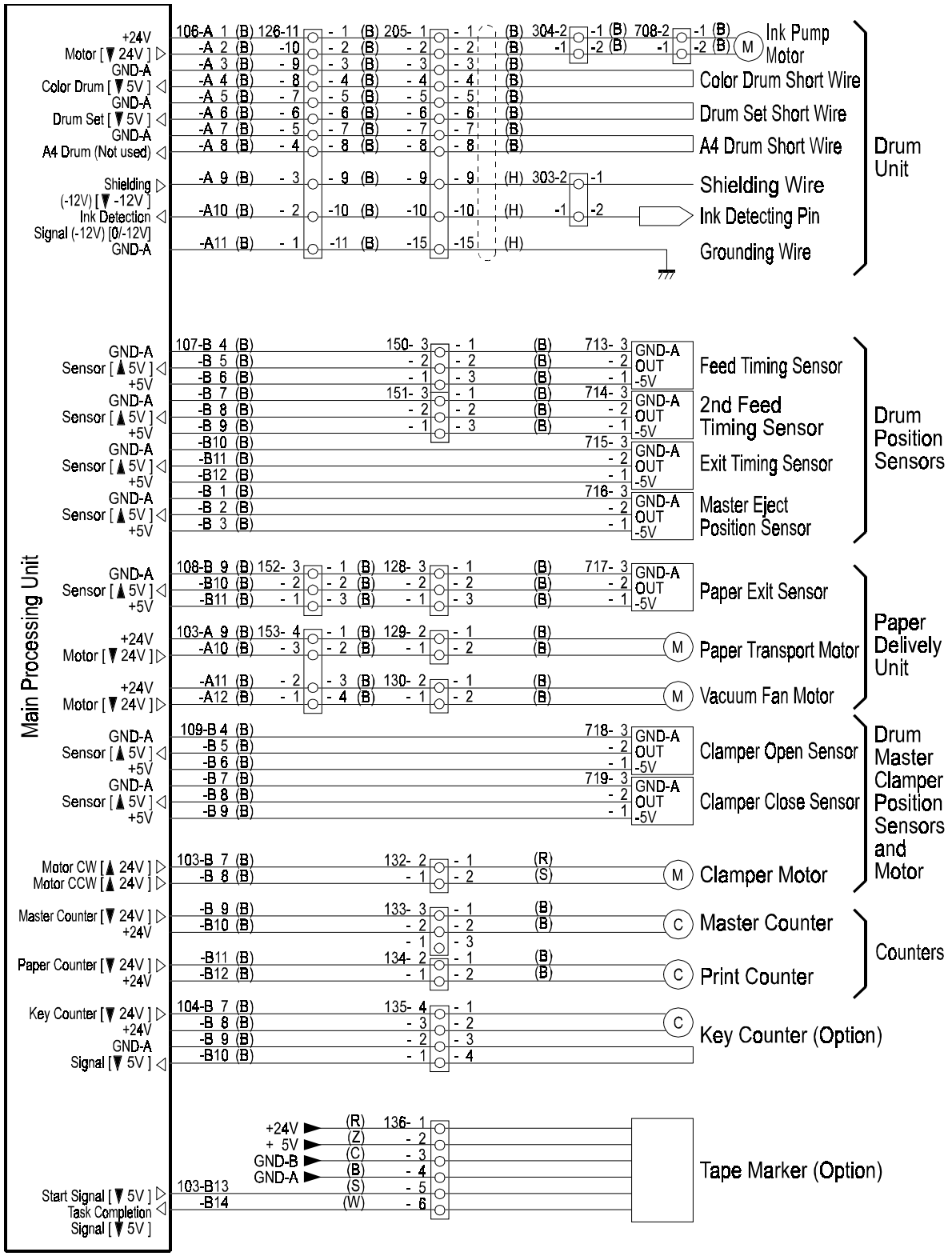
Section E



C231S505.WMF

P-to-P

Section F



C231S506.WMF

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